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FOREST SERVICE

BRANCH OF RESEARCH

MONTHLY REPORT

OF

FOREST EXPERIMENT STATIONS
FOREST PRODUCTS
FOREST ECONOMICS
RANGE RESEARCH

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BRANCH OF RESEARCH

September, 1930

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FOREST EXPERIMENT STATIONS

ALLEGHENY FOREST EXPERIMENT STATION

General

Temporary Assistants Birger Berg and A. L. McComb left us on the completion of the major portion of the summer's field work. The services of Berg in particular have been very valuable to us this summer.

The Botanical Society of Pennsylvania, under the leadership of Dr. True of the University faculty, is planning a forestry program for the coming winter, consisting of five lectures on one phase or another of forestry. The Station will contribute two of these lectures, and we hope the Forest Products Laboratory will be able to contribute a third.

Among our visitors of the month have been W. D. Brush, of the Washington office, and Max J. Plice, studying under Dr. Romell at Cornell. Plice and Dr. Kelley, the latter formerly of our staff, visited Camp Ockanickon, being particularly interested in Wood's plan to write a joint article with L. L. Lee on the correlation of vegetation with soil type. Dr. H. H. York of the University faculty, returning from a summer spent in New York State, reports that he never saw a season in which tree diseases were more destructive. In addition to a new and what may prove to be a serious additional threat to white pine, in the vicinity of Rochester, New York, he reported the considerable dying of red oak in southern New York, and of white ash on Long Island.

Wood began the preparation of a descriptive folder covering our headquarters tract at Camp Ockanickon.

Forestation

The data from the last examination of the chestnut oak acorns planted at Camp Ockanickon in 1929 have not been fully analyzed to date, but some facts are already apparent. Of the 224 acorns planted without rodent screens, a single acorn survived to germinate. Of those acorns planted (under screens) with the radicle down, only 36 per cent finally germinated and this germination was greatly delayed. Of those planted radicle up, 78 per cent germinated at the normal time. Where acorns are planted on a large scale by dropping them into dibble holes, Wood calculates that it is possible for one-third of them to fall radicle down, assuming that each acorn would come to rest in one of three positions. Of the several lots of acorns planted at various depths, and with different depths of litter cover, those at half an inch germinated best;

there was no germination among the acorns which were left exposed on the surface.

Management

The summer's work on the east branch of Tionesta Creek, Allegheny National Forest, was completed about the middle of the month. Hough's crew obtained 652 one-tenth acre plots in this virgin area, and attained a record of tallying 50 in one day. Judging from the experience we have had with the much smaller number of plots obtained in 1929, it is certainly going to be necessary to place these data on punch cards, if we are to do the job of analysis within a reasonable length of time.

Wood completed a technical note on windthrow of hemlock.

Wood's check of the chestnut oak seedlings at Camp Ockanickon showed that the small plot which in the fall of 1928 had 187 germinating acorns on it, could boast only two surviving seedlings. Last spring there were three. Of these, two died back, and the new growth for 1930 did not exceed the 1929 growth, so that the seedlings made no net increase in height over the first season's growth. The third seedling died during the past summer. This is a survival percentage of 1.07. Only 0.18 per cent of the 1080 acorns on this plot in 1928 has produced a surviving seedling. Of the 40 seedlings of chestnut oak germinating immediately around the headquarters cabin at Camp Ockanickon in the fall of 1929 all except one were alive this fall. Many, however, had died back and sprouted again from the base. Sixteen of these seedlings were trenched during July by sinking a spade in a circle surrounding each of them; 12 were left undisturbed as controls. They were remeasured once during the summer and will be remeasured again at intervals during the next few years. They are in fairly heavy shade.

Measurements

Under Morey's leadership 412 butt taper measurements were made at Heart's Content, and 418 height measurements. The taper measurements, which were made at half-foot intervals from the ground up to 6 feet, were necessary if we are to convert the age counts which we are making on the stumps adjacent to Heart's Content to a D.B.H. basis. There was no particular difficulty about scraping away the great accumulation of pine needles in order to obtain at fixed heights satisfactory measurements of the white pine, but the buttressing of the roots introduced considerable difficulty.

Wood reports some surprisingly rapid growth of sprouts at Camp Ockanickon. On a portion of our planting site which had been deliberately cleared of oak and pine in order to give the planted stock a chance, chestnut oak sprouts had grown from 2 to 8 feet in height during

the summer of 1930,and pitch pine sprouts had grown from one-half to three feet. Similar rates of growth were observed for sprouts which resulted from the very severe fire of last spring, in spite of the lateness of the season when the fire occurred.

Types

Forbes spent considerable time on committee work for Professor R. C. Hawley's type committee for the entire East. He used material from both Camp Ockanickon and our extensive surveys to prove that the extreme sub-division of types which is advocated by some of the other sections, and which has resulted in a list of 124 types, is unnecessary and illogical. The Allegheny Section Committee, of which Forbes is chairman, does not believe that we can go so far as to set up types which are designated by only one or two species. There will of course be exceptions to this, as where trees typically occur in pure stands.

Wood has been working on the inventory data from Camp Ockanickon, to correlate it with the soil types. Our collaborator, Mr. L. L. Lee of the New Jersey Agricultural Experiment Station, believes that the publication of these data will be of real value.

Pathology

The activities of Forest Pathology during the current month have been concerned chiefly with the organization and equipping of the new laboratory at MacFarlane Hall. We have acquired from the Botany Department two rooms on the third floor of their annex at 3436 Walnut Street, one room of which will be given over to office quarters, while the other one will be used for herbarium and storage.

Two weekend trips were made to Camp Ockanickon, to find out how that area may be used in connection with our studies on the decay of oak coppice. It was a revelation to find that the sporophores of several oak decay fungi occurred in comparative abundance throughout the stand of oak coppice at Camp Ockanickon. It will also be of interest to forest pathologists to know that three fair-sized sporophores of what has been determined as Hydnum erinaceus were found on white oak sprouts, and moreover, each one was associated with a scar. They have been photographed and cultured.

Additional information pertaining to oak cutting operations, plantations, and nurseries, in this region has been obtained through the courtesy of the forester for the Pennsylvania Railroad Company.

APPALACHIAN FOREST EXPERIMENT STATION

General

E. N. Munns, of the Washington office, spent a week in Asheville, reviewing the Station's activities and discussing plans for the future. He and Frothingham left with the Coastal Plain party to be present at the resumption of the loblolly pine study at Franklin, Virginia.

The entomological work at Bent Creek was brought to a close the latter part of the month and R. A. St. George, who has been in charge, returned to Washington. Before St. George's return, Dr. E. J. Kraus, professor of botany at the University of Chicago, accompanied by Mr. Eric Ashby of London, England, spent a short time at the Station en route to the Smoky Mountains. They visited the Bent Creek laboratory where Ralph Caird, a former student of Dr. Kraus, was conducting a series of experiments for the Bureau of Entomology.

Dr. Carl Hartley, of the Washington office of Forest Pathology, spent three days at the Station in conference with R. M. Nelson.

C. J. Telford of the Forest Products Laboratory came to Asheville, chiefly to discuss the work of the Farmers' Federation in marketing farm wood products.

Forest management study in north Georgia

General plans for this study were agreed upon in a conference at Blairsville, Georgia, in May, between Frothingham, Director Stuckey of the Georgia Agricultural Experiment Station, and State Forester B. M. Lufburrow. These plans provide for a study of the growth, condition, and reproduction of the more important forest types in north Georgia, leading to a preliminary publication, one purpose of which will be to outline important problems for future study. It was further agreed that a few permanent plots would be established for methods of cutting and thinning experiments, to provide means for checking the data on rate of growth obtained by borings in the more extensive surveys.

The work was actively started September 11, when Frothingham, Hursh, and Coville met Messrs. Stuckey, Lufburrow, and Stone at Blairsville for further discussion of plans in the field. Locations of two pairs of sample plots on the Mountain Station tract of the Georgia Agricultural Experiment Station were surveyed and the plots staked out. Later some test surveys were run to work out the best procedure for obtaining growth data.

Under Hursh's direction the more important forest types north of the Blue Ridge and representative condition classes in them have been determined, and the work is now proceeding as follows: One-half acre growth sample plots are being taken in each class, the number of plots being regulated by the extent and importance of the class. On each plot growth borings, together with tree descriptions, are made for enough of the upper crown cover trees to furnish a record of the past two decades' growth of the stand, a basis for determining the probable future increment, and cumulative data for a site analysis. Such data will be obtained from a thousand or more trees.

Methods of cutting -- hardwoods

At Bent Creek cutting was begun on a unit of 6.7 acres. The whole unit is to be clear-cut. All brush and small trees were removed on the area at a cost of $38 (16 man days). Next the cord wood will be removed. It is expected that the wood in this overstory will no more than pay for its removal, since the stand was open and made up of poorly formed trees. The object of this cutting is to produce an even-aged stand of reproduction in which cleanings and release cuttings may be tried. It is to be contrasted with two sorts of partial cuttings which are to be made near it.

District Ranger Charles Dunn of the Pisgah National Forest staff marked a unit of 9.7 acres under timber sale practice. Here only 109 trees, scaling about 21,000 board feet, were marked for removal. There will be left on the area a considerable stand of material unmerchantable because of small size, poor quality, or poor species. Except on a small sample plot within the unit this unmerchantable stand will be left untouched.

A third unit of about 11 acres has been marked for a silvicultural improvement cut. All silviculturally undesirable trees have been indicated for removal. A sale will be made of all marked material which is merchantable, after which the remaining marked trees will be eliminated, by felling on one part of the unit, and by girdling on another part; so that costs and results of these two methods may be compared.

All units to be treated have been photographed from several different viewpoints. These camera points have been permanently marked. The series of pictures to be taken from them will give a graphic record of the development of the stands under treatment, and will be a valuable addition to the data which have been collected on the units.

Abell and Buell made a two-days' inspection trip to the grazing damage plots on Curtis Creek and recommend that since the grazing project has been discontinued the plots be maintained by the Mc-2 project. They also looked over a pair of ME plots and recommend that

they be remeasured this fall.

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Hursh and Sims, cooperating with Nelson, completed the summer's field work on the fire-damaged plots in Virginia and Wooten brought to a close the laboratory experiments upon which he had been engaged during the summer.

Biological Survey

Biological activities for September have been along the same lines as in previous months but over a wider area. Because of the newly inaugurated work in Georgia, Burleigh spent 10 days in that State so that biological investigations might be correlated with other phases of the Station's activities.

Incidental activities included conferences with both State and Federal forest guards relative to their cooperation in securing stomachs of the larger mammals for analysis of food eaten.

Weekly observations on Mount Mitchell have been continued and the fall movement of birds at this high altitude recorded in detail.

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CALIFORNIA FOREST EXPERIMENT STATION

General

On September 2 was held a session of the Station Advisory Council. The Station was fortunate in having both Clapp and Granger present. Mr. Clapp gave an excellent review of the growth of the Forest Experiment Station movement in the United States, and Granger discussed his Forest Survey project in relation to California. Regional Forester Show also made a plea for the initiation of grazing research by the Experiment Station, especially in relation to the appalling erosion conditions, due almost entirely to overgrazing, which he has recently observed in the foothills surrounding the southern San Joaqin Valley and extending eastward through the desert to a considerable portion of the east side Sierra slopes as far north as the Mono.

The work and plans of the Station met the approval of the Council. Resolutions passed by the Council included the following:

1. That the next line of work undertaken by the Station should be the study of grazing and its relation to erosion, for which a Federal appropriation of $25,000 was urged.

2. That material expansion of the work on erosion in lines already established is urgently necessary and that federal funds available for it should be increased to at least $25,000 per year.

3. That the Forest Survey should be prosecuted as fast as money can speed it, and that the Federal Government should at once make appropriations for this project up to the full authorization of $250,000 per year.

4. That the State of California be urged to increase the appropriations for cooperation of the State with the U. S. Geological Survey in speeding up the completion of the topographic map of the State.

During the month a statement was prepared covering the work of the Station on water conservation and erosion control in or applicable to the Los Angeles Basin. This is for a symposium statement which is to be published by the State Engineer showing the work of all agencies now engaged in such research with respect to this basin, the object of which is to forward mutual understanding by all interested agencies of what each one is doing in the problem.

Some further progress was made in respect to personnel for the new work of the Station in fire research and in forest management in the redwoods. The appointment to the fire personnel of John E. Curry, Assistant State Forester of Maryland, has been approved by the Secretary and the Civil Service Commission. The appointment of several others it is hoped will be cleared up within the next few days.

Visitors during the month included Dr. W. T. Swingle, Principal Plant Physiologist of the Department of Agriculture; John Kinney of the Indian Service; Peter Keplinger of the Washington Office of the Forest Service; and Professor J. S. Boyce of Yale University.

Cover Type Map

A letter from C. R. Clar, may be of interest to those working in dendrology:

> "We had expected strange types in the Tehachapi Mountains, and no mistake was made. Every drainage may be a distinct botanical unit. For instance, the northern two-thirds of the range is without chamise or manzanita, yet the scrub variety (semota) of Quercus garryana is abundant. Valley oak thrives on mountain tops (and such mountains). One

drainage (El Paso) bears white fir pure, from 4000 to 6000 feet without a single yellow pine. There is a clump of sugar pine facing the Antelope Valley with Pinon for company. Just as soon as I find moss growing on yucca, I am going to apply for admission at the Napa Asylum".

Lysimeter Experiments

Unexpected results were encountered in the soil erosion studies being conducted under experimental control in large tank lysimeters. Gradients from 5 to 25 per cent did not show a corresponding correlation with percentages of surficial run-off. In fact the run-off coefficient was remarkably uniform for all gradients when intensities of rain exceeded the percolation capacity of the particular soil employed in the experiment. Amounts of eroded material, however, showed a striking correlation with gradient.

The working hypothesis has had to be altered somewhat and now is that soil texture is a more important factor in erosion and run-off than gradients within limits yet to be determined.

Northfork Surficial Run-off and Erosion Installation

Sundling and Lowdermilk completed the installation of a third pair of run-off plots at Northfork. The installation has been brought up to a complete unit as the past results have indicated to be desirable. Such a unit calls for two cover run-off erosion plots in duplicate, two burned plots on which vegetation is allowed to return naturally to equilibrium, and two burned and denuded plots to be maintained in a bare condition from year to year throughout the life of the experiment. A Bristol strip chart recorder is used and is electrically connected with 6 run-off tipping bucket instruments and 2 automatic rain gages, making a total of 8 pens.

In addition to the run-off plots a battery of rain retention pans, and lysi-phytometers are in operation.

Volume-weight soil samples were taken to a depth of 5 feet to determine the total moisture content and moisture available to vegetation at the end of the dry season prior to winter rains. The method employed by Beckett, of using a heavy viscous oil was used for volume determinations. Wilting point determinations are to be made for samples from each of the 5 foot levels.

Interdependence of Soil and Vegetation

The soil coating of a landscape is dependent upon processes of weathering of the original consolidated or unconsolidated rock material favored by climate through time under the control of a mantle of vegetation. Vegetation plays a remarkable role; it accelerates weathering by supplying in the decay of its products, carbon dioxide to acidify soil waters; it supplies food for myriads of soil fauna; it prevents the rapid removal of soil by protecting the surface against erosive forces; in favoring the accumulation of a thick coating of soil, it again tends to retard the rate of weathering of the country rock. On the other hand vegetation is unable to develop to its maximum cover and growth without a deep coating of soil to serve the dual function of supplying a site and food for an active soil fauna and of storing water as field capacity moisture at the disposal of plant formations. A remarkable interdependence of long standing exists between the soil and its vegetation. The development of soil and vegetation have progressed dependently through periods of time often to be measured in geological terms.

The soil coating at the same time is subjected to erosional processes whose operation is reflected in the sculpturing of the landscape. An erosional potential is produced principally by precipitation, by soil texture, and by gradients of land uplift. The soil coating is subjected to the operation of erosional potentials under vegetative control. Topographic form represents, therefore, the operation of erosional processes under potentials of gradient, amount, and character of precipitation, and geologic structure as checked by vegetative cover. Erosion under these natural conditions may be designated a geologic norm of erosion.

Topographic form reflects vegetative control of the soil surface. The profiles of slopes under vegetative control generally take on a form convex to the sky. Exceptions to this rounded form occur on the valley walls of rapidly intrenching streams, where the profiles are straight, forming V-shaped canyons. Such trenching occurs where the erosional potential is high in gradient and in flow of water. But drainage channels containing flows of lesser transporting capacity or intermittent lie in convex walled trenches under vegetative control.

Degredation under vegetative control of the surface proceeds in somewhat the following manner. The incising or cutting stream creates gradients on the faces of lower slopes, by undercutting, in excess of the angle of repose of soil. Soil creep in the entire layer of soil is thus generated at the lower face of the slope. A slow glacier like movement is imparted to the soil, whose rapidity depends upon gradient, soil texture, degree of saturation of the soil, and roughness of the buried country rock surface. Vegetation and its layer of litter effectively controls or prevents surface removal except where gradients exceed the angle of repose of the soil material. Burrowing rodents, however, by their innumerable workings are effective agents of soil

movement toward drainage channels as Grinnell has correctly indicated. Except on the steep gradients, however, vegetative control at the surface is sufficient, under complete cover, to maintain rounded topographic forms, convex to the sky.

In the absence of vegetative control topographic profiles are concave to the sky. Typical examples are apparent on every hand in mountains of arid climates, covered with sparse vegetation. Destruction of a mantle of vegetation so as to expose hitherto protected coatings of soil to the full extent of erosional forces, commences a change in profile curvature. The first indications appear in the profiles of gully bottoms, which are concave. Erosional phases typical of arid regions may be induced in humid regions when the protective mantle of vegetation is destroyed by whatever means.

The concept of a geologic norm of erosion is of primary importance in all studies of the influences by a mantle of vegetation on the regimen of water drainage. A geologic norm is not, however, a uniform phenomenon. It responds to varying supplies and intensities of precipitation, to faulting of rock structures, and to land slides. It represents the inevitable processes of degradation and planation of land forms measured in geologic time units. The geologic norm may be considered both as a limit of any measure of erosion control and also as a basis of comparison of accelerated erosion.

Erosion accelerated above the geologic norm is a second important concept. It represents the increased operation of an erosional potential caused by the removal of the control exercised by a mantle of vegetation. The destruction or consumption of vegetation may be caused by fire, lumbering, grazing or smelter fumes. The important condition which gives rise to accelerated erosion is the baring of the soil surface. Erosion is accelerated both by the removal of the protective mantle of vegetation and also by the presence of a thick layer of soil which is the product of vegetative control. Rates of accelerated erosion have been found by experimental studies to vary from hundreds to several thousand fold the geologic norm of erosion.

In studies of accelerated erosion, samples of areas of undisturbed vegetation are needed in each type of topography and vegetative formation. Without such areas it is difficult if at all possible to evaluate the extent of acceleration of erosional processes. In the foothill region of the Sierras fires and grazing have left the region without a witness of the original undisturbed vegetation. In such regions the only available procedure is to enclose areas from all use and fire to allow the present vegetation to develop in response to prevailing climatic conditions.

Special emphasis will be given to the recommendation that natural areas and enclosures be set aside to furnish a basis of evaluating processes of erosion for the present and future.

Forestation

A cooperative planting experiment with western yellow pine, initiated in April 1928, on a clear-cut private area of the Stanislaus Forest, was examined by Kraebel and Dunning. The experiment was designed to determine the effect of various methods of reducing water loss through transpiration (by dipping tree crowns in weak gelatinous solutions) and through evaporation (by shingle shading and paper mulching the trees). Survival ranged from 2 per cent to 64 per cent in the various tests. The effort to determine in the field the cause of failure of individual plants brought out strikingly the fact that the complexity of factors in such experiments must invariably becloud, if it does not altogether obscure, the issue. In this instance the plants were influenced by three potent factors quite extraneous to the major purpose of the experiment:

1. Logging debris, exhibiting the usual great variation in density over the area, created extreme variations in shade, temperature and soil moisture for trees within a few feet of each other.

2. The rapid growth of native shrubs created similar variations in "micro-site" and increased the complex by introducing competition.

3. Local variations in the planting site - from permanent marsh to well-drained and even very dry ground - subjected the trees to a gamut of site conditions all the way from standing water with intense marsh-grass competition to dry, bare soil.

4. Cattle, having free run of the area, caused mechanical injury to a majority of the trees and in varying degrees impossible of measurement.

The attempt to record and to weigh these many variables for each of 700 plants representing 10 different treatments results in confusion to the point of absurdity. By the time we have erased from consideration all plants killed by extraneous factors we retain too few comparable plants to be of any value to our original inquiry. The inference is obvious that, in planting as in all other research, we must isolate the factor we wish to study.

In the course of a week-end motor trip out over Sonora Pass and back through Tioga Pass, Kraebel and Brundage scouted the seed crop, noting abundance of cones on incense cedar and red fir, a medium crop on sugar pine and western white pine, and an almost complete absence of cones on white fir. Mountain hemlock showed a good crop throughout its range, but at timber-line, in association with western white pine, it was especially heavily laden.

Devil Canyon Branch

At Devil Canyon Branch, the time of Weaver and one laborer was occupied by screening the soil of additional transplant area, placing a new roof on the nurseryman's dwelling, and overhauling the rain gages and other instruments. Seed collecting was done incidentally as required by the seed ripening.

Lumber Depreciation

One trouble in presenting degrade tabulations arises from the necessity for showing not only what per cent of an original grade-thickness-width group is depreciated but also the varying extent or severity of such depreciation. The higher the original grade, the greater is the possible dispersion of the degraded portion, and when this dispersion covers four or five different grades, as it frequently does, tabulation covers too much territory.

An illustration of the difficulty and our solution may be interesting to other workers. In the single item of C & Better white fir, 8-11 inches wide by 1 inch thick, the total degrade is 25 per cent. This is dispersed as follows:

3%	drops	to	#1	Common
7%	"	"	#2	"
13%	"	"	#3	"
1%	"	"	#4	"
1%	"	"	#5	"

This tells the complete story, but the data are too bulky to permit easy, rapid comparison of one width group with another in the same thickness class, or of one thickness with another. To overcome these objections, Brundage has worked out a method for giving an approximately equivalent measure of the same qualitative down-fall, expressed as a "degrade factor".

This is done by multiplying each grade-fraction of the total degrade by the figure corresponding to its number of grades below the original, adding the separate items and dividing the total degrade percentage. In the example cited above, the computation is:

3% - #1 Com.	=	.03	x 1	=	.03
7% - #2 "	=	.07	x 2	=	.14
13% - #3 "	=	.13	x 3	=	.39
1% - #4 "	=	.01	x 4	=	.04
1% - #5 "	=	.01	x 5	=	.05
			Total		.65

Divide by total per cent degrade: $\frac{.65}{.25} = 2.60$ (degrade factor).

Translated literally, this means that all of the degraded material in this particular grade-size class fell an average of 2.6 grades. Besides the convenience of such an abbreviated index of quality depreciation from the standpoint of ready comparison between different size classes, the factor can be used to calculate loss in value. This is done according to the following procedure:

First Step. The whole number in the degrade factor shows the average number of full grades depreciation below the original. Find the price differential per M feet corresponding to this drop.

Example: Original grade C & Btr; value $40.00. Factor = 2.60. Two-grade drop goes to #2 Common, value $22.50. Differential, $40 - $22.50 = $17.50

Second Step. Find the price differential between this and the next lower grade, multiply by the fractional part of the degrade factor and add result to first differential.

Example: (Continued from above): Next lower grade is #3 Common; value $17. The differential between this and #2 Common is $22.50 - $17. = $5.50. Multiply by .60 = $3.30. Add to $17.50 = $20.80. This figure is the total loss in value per M feet equivalent to a drop of 2.6 grades.

Third Step. Multiply total differential by total per cent of degrade. The result is the approximate loss in value per M feet, green to rough dry.

Example: Total differential = $20.80. Degrade per cent = 25. .25 x 20.80 = $5.20, loss in value on a thousand feet of original 4/4 C & Btr., 8-11 inches wide, air dry.

Application of the degrade factor for calculating loss value is much simpler than explaining how it is done. A table of selling price differentials for ready reference reduces the work to a couple of simple calculations hardly requiring more time than is necessary to glance at the figures. Results are not exactly the same as those obtained by the conventional method of calculating the weighted average value on the per cent-each-grade basis, but they are close enough for all practical purposes; at least the method has worked out that way in the California study, whenever the two systems were compared. A few examples will show the correlation.

Grade (W.F.)	Thk	Width	Value of Degrade Loss: Conventional method	Value of Degrade Loss: Degrade factor
C & Btr	4/4	8/11	$ 5.14	$ 5.20
C & Btr	4/4	12"	8.16	8.18
#2 Com	8/4	12"	1.98	1.96

California Economic Research Council

Eighteen months ago Hill's Committee on Natural Resources attempted to bring the weight of the Council to the support of an increased appropriation under the terms of the Temple Act for State cooperation with the U. S. Geological Survey in topographic mapping, the slow progress in which is so hampering our Station cover type map as well as projects of many other agencies. Everybody, State Director of Finance included agreed in the desirability of the proposal. The movement failed, however, because when the matter was brought to our attention the State budget had already gone beyond the possibility of modification. Now a new biennial budget is up for hearings and on September 26 an audience was obtained for our Committee with the Director of Finance. A number of able and influential men gave their backing to which was added an especially strong presentation by the State Engineer. It is hoped that the increase to $110,000 for the biennium for this purpose in the budget now submitted by the State Division of Engineering may be approved. Plea was also made for an increase in the item for cooperative stream gaging and for continuance of the appropriation for snow surveys which was initiated as a result of the support of the Natural Resources Committee in the last biennium.

Consulting Entomologist

During the first part of the month the field work in the Modoc area was completed for the season. All of the remaining permanent check plots, which are being cruised annually to determine the trend of the western pine beetle infestation in the area, were cruised and all trees killed since the 1929 cruise were marked and recorded. A report on the conditions found will be made within a short time. Final records were taken on the 15 trees that are being followed in the biological control study and sample counts of attack and emergence were also made on 10 recently abandoned trees which had been left standing. A few days were spent at Buck Creek where the Buck Creek check area was cruised and the fire study plots were examined. Seven of the severely defoliated trees have been killed by the western pine beetle since the last examination in May, 1930.

Some time was spent in assisting Mr. Wagener, of the Office of Forest Pathology, in collecting sample sections from trees killed by the western pine beetle. Samples were taken from newly attacked trees, from trees which had been attacked early in the summer and from trees which had been attacked one year before. These samples were shipped to Madison where tests will be made to determine what effect, if any, the associated blue stain has on the physical properties of the wood.

About the middle of the month the field studies were concluded and the equipment packed and either stored at Buck Creek or hauled to Berkeley. The last part of the month was spent in Berkeley where we are now

getting established in our new quarters in Giannini Hall, and starting work on the reports on the summer's work.

Durbrow brought to a close his field work on the relation of pH of the inner bark of western yellow pine to the tree selection habits of D. brevicomis and left for the Lassen National Forest on September 17, where he will assist Salmon and Furniss on some insect surveys in the vicinity of Harvey Valley.

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CENTRAL STATES FOREST EXPERIMENT STATION

General

McCarthy with the assistance of F. W. Dean, Extension Forester of Ohio, planned the fall field meeting of the Ohio Valley Section, Society of American Foresters to be held late in October. Among other features of the meeting a demonstration will be made of a Champion Sheet Metal Company reforesting machine. This planting demonstration is made possible through the cooperation of this company and State Forester Secrest of Ohio.

Plans were partly completed during the month for a meeting of a Forestry Congress for the Central States region. This is a cooperative effort of a number of agencies in the Central States region.

Barrett examined the forest tree seed crop in eastern and southern Ohio in response to a request from a Japanese Forest Experiment Station for seed from this region. The white pine, shortleaf pine and pitch pine crop is practically a failure. White ash is relatively abundant. Walnut is prevalent but the seeds are small.

Plantation Study (Fp-1)

During the month the field inspection of walnut stands in Illinois was continued by Dodge and Thielking until Dodge returned to Ames on September 16th to continue his school work. Following Dodge's departure, Kellogg and Thielking continued taking plots for a week in the southern portion of the walnut zone in Illinois. Kellogg returned to Columbus following Thielking's departure on the 21st.

Contact was made with State Forester Miller at Springfield, Illinois. He and Assistant State Forester Locke gave valuable information on the location of black walnut stands in Sangamon County.

While near St. Louis, Kellogg visited Walter Eckstein of the Pickrel Walnut Company. The same defect is being found by this company in the native walnut as is being reported by other producers. This defect appears as T-shaped pits on lumber, and as holes in veneer. Its cause is not definitely understood. Walnut timber from southeastern Missouri especially is displaying this defect so commonly that the Pickrel Walnut Company has discontinued the purchase of logs in that locality. To date this defect has not been reported in plantation walnut.

The Morton Arboretum

Kellogg and field party visited the Morton Arboretum near Lisle, Illinois. Through Dodge, contact was made with the personnel of this property, and permission was secured to take measurements in all the forestry plots. Only the black walnut and yellow poplar plots were measured, however. Besides these species there are test plantings of several conifers and many species of hardwoods. Pruning is being used to produce trees with a straight and erect form. It is the policy of Joy Morton, the founder, to publish in bulletin form the results of plantings and tests of shrubs and trees. In the published reports which have appeared covering measurements on the forestry plots, measurements are given in terms of eights and sixteenths of inches and diameters are taken three feet above the ground. These records will make comparison with standard forest measurements very difficult.

The planings of A. M. Abbott near Fulton in Whiteside County, Illinois, were visited in order to inspect and sample the black walnut which was placed there. This is a very fine example of the success to be gained by planting blowing sand to fix and hold it. About 56 acres were planted, using catalpa, cottonwood, black locust, Osage orange, mulberry, and small quantities of white pine, black walnut and green ash. The plantings have been made in a mixed and heterogeneous fashion, with only small areas or 1-3 rows of most species in block form. The walnut, catalpa, and ash are collected and were put on the best soil. Fortunately great quantities of locust were used. Besides binding the sand the other species have been benefitted by its presence. Borer damage has prevented the production of locust posts. The neighbor to the south did nothing with his portion of the dune.

Fire ran over the area in May 1930 caused either by incendiaries or the railroad to the west. Mr. Abbott managed to shield the white pine and walnut. Although not heavy enough to consume the wood and twigs on the ground, the fire catfaced all species of trees on the dune. Much locust was killed outright.

Oak Yield Study (TS-12)

Acting on information from Extension Forester Sawyer, Kellogg went immediately to southern Illinois to secure measurements of post oak. The cutting had been completed earlier and no measurements were possible, as cuts had been removed and peeled prior to his arrival.

Woodland Grazing Study (Pa-1)

Day, Lucas and Sowash, during the first ten days of September, located and measured seven semi-permanent plots in the elm-ash-maple type common to the lake plains of northwestern Ohio. In general the woodlots of this section are in a deplorable condition. Out of one hundred and twelve woodlots examined during this period thirty nine had been so completely devastated by fire, cutting, grazing, drainage or salt water that regeneration appears practically hopeless. Not over 5 per cent of the farm woods in the section of the state can be considered as being in a productive condition. The development during the last few years of the tomato catsup industry about Bowling Green has been responsible for the extensive system of ditching and tiling which forms a complete network over thousands of acres. The result of this lowering of the water table is apparently bringing about a gradual change in the composition of the ungrazed stands. The American elm and black ash are dying out and their place is being taken by red oak, shellbark hickory and basswood. The development of oil and gas wells is also having its effect on the woodlands. Natural drainage of salt water brought to the surface by the pumping of oil wells has killed considerable timbers in the region. On one farm in Wood County seepage of this salt water has killed a stump of timber nearly 100 yards on either side of a shallow draw draining from a well over a mile away.

After the departure of Lucas, the party moved to northeastern Ohio where a number of the woodlands classified under the Ohio Forest Tax Law were examined. In contrast to the ragged stands in northwestern Ohio, the beech-maple woodlands of this section are usually in a good productive condition. While the livestock industry is very important in these counties there is sufficient open pasture land so that the farm woods are not heavily grazed and many tracts can be found which have not been grazed for periods of ten to twenty years. It is certainly encouraging in this section to see the rapidity with which yellow poplar is becoming established in the woods following their release from grazing. In one instance, three two-year old seedlings were found on the lee side and thirty rods distant up a 5% slope from the parent tree, which is not over sixty feet high.

Day joined DenUyl at Logansport early in the month and they directed the discing of a tightly sodded plot on the farm of Marion C. Casebeer.

The weed species such as ironwood, honey locust, and hawthorn were removed and a tractor drawn disc was run over an acre plot of oak-hickory woods to determine if breaking up the sod cover would materially increase the percentage of germination of the heavier seeded species. A check plot was established adjacent to the disced area and seed counts have since been made by DenUyl.

With the close of active field work this fall, it is believed that sufficient data have been secured to fulfill the purposes of the empirical study and that further work will be confined to intensive study of permanent sample plots. In the three field seasons during which this study has been carried on 208 semi-permanent plots have been located and measured. Over 1800 farmwoods have been examined in the eight states comprising the territory of this station. Dr. Meyer, to whom the project was originally assigned, located fifty three of the plots in Indiana and Illinois during the summer of 1928. In the field season of 1929 Day covered the remainder of the region in a rapid reconnoissance and measured seventy four additional plots. During the past summer Day and DenUyl of the Purdue Agricultural Experiment Station measured sixty plots in the classified woods of Indiana and Day in addition secured seventeen plots in Ohio. The distribution of these plots is shown in the following table:

Distribution of Semi-Permanent Grazing Plots

State	Grazed	Ungrazed	Grazed in Past Ungrazed at Present	Total
Ohio	14	9	5	28
Indiana	17	16	60	93
Illinois	15	5	4	24
Iowa	11	5	5	21
Missouri	8	2	3	13
Arkansas	4	3	-	7
Kentucky	7	5	-	12
Tennessee	3	3	-	6
Total	79	48	77	204

Litter Study (M-1)

Auten completed examination of virgin forest sites in Illinois about the middle of the month. His search for undisturbed tracts of timber land in Ohio, Indiana and Illinois has demonstrated the scarcity of such areas. Although this field inspection was preceded by a careful inquiry among agencies informed as to the location of the older stands of timber, many tracts were visited which had been disturbed by cutting of selected trees of the best species such as walnut, yellow poplar and white oak. Grazing had changed the character of other stands in which no cutting had been done.

To most local people a woods remains virgin as long as a few of the original large trees remain uncut. C. C. Deam who has a most complete knowledge of Indiana's forests, said "Virgin sites are as scarce as hen's teeth."

While the summer's work brought to light some eight or ten tracts which had been disturbed very little, so that they may be classed as virgin, about forty were satisfactory for the purposes of the study.

If these near virgin stands are not to join the passenger pigeon, immediate action will be needed to preserve them. One of the best found is now on the market. Its white oak trees, the largest 43 inches in diameter will quickly attract a buyer.

The forest litter, even in virgin forest, is very thin and disintegrates quickly in the zone of forest bordering the prairie. Control of fire through the breaking up of prairie into agricultural land has allowed the forest to encroach on the black soils which were formerly grass land. Kellogg's observations in comparison with original survey records show that present forest boundaries extend beyond the earlier boundary indicated by the survey records in several places in Illinois. This tendency toward encroachment of forest on the prairie may be reversed where grazing has been severe.

Auten found a greater percentage of capillary moisture in the upper nine inches of forest soils than in the same depth of soil in adjoining fields. However, the unusually dry season reduced the capillary moisture of forest soils very near the wilting point. Silt loam soils were found in August with less than 5 per cent of capillary moisture in the upper nine inches and one soil type in southern Michigan had only 2 per cent.

Although the virgin forest soils have a low humus content, they are much more porous as indicated by a lower apparent specific gravity for the upper nine inches as compared with the same soil types in adjacent cultivated fields. This difference amounts to about 10 per cent.

INTERMOUNTAIN FOREST AND RANGE EXPERIMENT STATION (August)

General

Dr. Stewart Joins Staff of Intermountain Station

Dr. George Stewart, formerly head of the Agronomy Department and Experiment Station Agronomist at the Utah State Agricultural College, has accepted appointment effective September 1 as Senior Forest Ecologist with this station. Dr. Stewart graduated from the

Utah State Agricultural College in 1913 and was engaged in teaching and research work at that institution from the time of his graduation to September 1, this year, except for graduate work. He received his M.S. degree from Cornell University in 1907 and his Ph. D. degree from the University of Minnesota in 1926. He became head of the Agronomy Department and Station Agronomist in 1922. He has dealt extensively with agronomic problems in both dry land and irrigation farming. He has done extended writing on western agriculture and is the author of one text book on alfalfa growing and co-author of several other books. He has written approximately 20 bulletins and 25 technical papers giving the results of his research work. For a long time he has been keenly interested in range problems. One of his bulletins entitled "Our Public Domain" deals in detail with the public domain problem.

Dr. Stewart will have charge of the work on spring-fall and winter range.

S. B. Locke Joins Station Staff as Biologist

S. B. Locke, formerly of Region 4, was appointed Associate Biologist in the Biological Survey on August 1 and has been assigned to the Intermountain Station to work on problems on forest and range biology as authorized by the McSweeney-McNary act. Mr. Locke is a graduate of the University of Maine and has received his M. F. from Yale. He was appointed in District 4 in 1910. Since that time he has been engaged as technical assistant, forest supervisor, and assistant in fish and game management in the Office of Lands. As a result of his work in game and fish management he has become recognized as an authority on this subject in the Intermountain region. Mr. Locke has worked out a great many of the details in the handling of the deer situation on the Kaibab National Forest.

His first assignment is to study the role of rodents in the erosion problem. He will also continue studies in game management and relation of grazing to timber growing on several of the national forests in the Intermountain region.

Influences

Utah Floods

The summer season of 1930 in Utah has been one of torrential rains and numerous floods throughout the state. On July 10 a heavy rain struck the mountain slopes to the east of the valley between Ogden and Salt Lake City. This resulted in a heavy deluge of mud and water at the mouth of each canyon which poured forth to do heavy damage to highways, railroads and some of the most valuable farm lands in Utah. A number of

homes were completely destroyed by the mud flows. A series of heavy rains occurred again from the latter part of July until the middle of August during which floods came out of many of the canyons throughout the state. Two additional flows of water and mud came out of the canyons in Davis County adding to the destruction of the July 10 flood, and still another flood came from these same canyons on September 4. A flood of a degree equal to those in 1930 occurred in certain of the canyons in the Davis County area in 1923. These floods afforded an opportunity of a lifetime to study the influence of plant cover on the watersheds on run-off and erosion. The Station has taken advantage of this opportunity and in cooperation with the Utah State Agricultural College is carrying on as thorough a study as time will permit.

One of the features on the areas on which these floods occurred is the fact that the old shore lines of Lake Bonneville which occupied much of Utah during Pleistocene times have left a record by which the story of earlier floods and erosion may be read. It is pretty generally agreed among geologists that Lake Bonneville receded to the present shores of Great Salt Lake not less than 20,000 years ago. The geological formations at the mouths of the canyons, in the canyons themselves, and on the main watershed at the heads of the canyons, indicate quite clearly that the floods such as occurred in 1923 and again in 1930 had not occurred previously since the time Lake Bonneville receded. This indicates either unprecendented rainfall since the recession of Lake Bonneville or that some other change has taken place. A study of the available rainfall records show that the rains of 1923 and 1930 are among the heaviest since rate-of-fall records were started in Salt Lake City 37 years ago; but records at the Great Basin Branch Station show that rains of almost equal intensity have occurred there several times since 1915. Moreover, it is unreasonable to assume that rains equalling or exceeding those of 1923 or 1930 in amount or in intensity have not occurred many times since the recession of Lake Bonneville. The principal change in conditions surrounding the floods is to be found in the almost complete denudation by abusive grazing and fire of critical areas at the heads of the watersheds. Thus, for the first time in this region, we have convincing geological evidence that the geological norm of erosion is now being greatly exceeded and that excessive erosion and run-off is taking place at an alarming rate as the result of destruction of plant cover on the watersheds.

Salina Canyon Flood

Nelson and Craddock made an inspection on August 7 of the recently flooded Salina Canyon on the Fishlake N.F. Salina Canyon and its tributaries form an important watershed that furnishes irrigation water for the farmland that lies adjacent to Salina. These floods were the result of heavy storms which occurred on August 1 and 2 over the entire watershed.

The main canyon extends approximately 30 miles in length and lies primarily in the juniper-pinon belt of vegetation. Numerous side canyons enter it with some starting at the higher elevations in aspen cover. Generally speaking, the topography is not extremely rough except in the lower portion of the main canyon which has steep rocky slopes.

Observations showed that there had been a large amount of gullying throughout the canyon, particularly on areas low in vegetative cover. On areas that had a good herbaceous cover, principally blue grama grass (Bouteloua gracilis), practically no gullying had taken place, while on areas devoid of herbaceous cover there was serious gullying.

During a period of ten days in late July and early August, heavy rains occurred at the branch station above Ephraim. There was a total precipitation of 2.76 inches at the oak zone guage below the Station and at the Station itself 4.86 inches. During this period there was no flood in Ephraim Canyon and high water only on one day. Because of the excellent vegetative cover on the Ephraim Canyon watershed there was only slight damage by erosion.

Boise Erosion Project

The relative importance of sudden torrential summer storms as agents of erosion was amply demonstrated over parts of the Boise watershed during August. The recorded precipitation varied for individual storms from 0.74" at Boise to nearly 2.0" over portions of the Sawtooth Forest. Renner, Pearse, and Field Assistant Roberts were in camp at the mouth of Shake Creek on August 9 when the most severe storm occurred. Pearse set up several monuments to mark the highest points reached by the rising streams intending to compute the increase in streamflow resulting from the storm. About that time the rain really started and his monuments, along with the camp "refrigerator" containing the supply of vegetables, butter, etc., started for the Arrowrock Reservoir. Pearse's valient attempt to dive into the Boise River after the last can of butter was unsuccessful. Shake Creek and Willow Creek with depths of approximately six inches before the storm, rose to a depth of between three and four feet. Some idea of the amount of material carried into the stream channels may be gained from the fact that the South Fork of the Boise River, which normally is clear during the summer months, failed to run clear until the eleventh day after the storm. These storms, while general over the Boise-Sawtooth area, varied tremendously in intensity over the region affected. Gullies in the head of Slater Creek, for example were deepened fully three feet while on the steeper, more thinly vegetated Smith Creek area less than two miles distant, but little new erosion resulted.

Forest Management

The preliminary survey of the western yellow pine type in Idaho now being conducted by Mr. Watts, is proving to be of real value in locating possible centers of work for future study. Several areas which were cut over as much as 35 years ago, and where cutting methods closely resembled our present day selection system, have been found.

The Boise Basin region is rich in areas for yield table plots. Cutting in this area started in 1862 and was particularly heavy for a period of 20 years during the mining boom days - much of the accessible area was cut clean, even down to cordwood size black jacks. Fortunately, some set of conditions brought about almost, if not quite, complete stocking over considerable of the area. Thus there are available even aged stands of different ages in a relatively small scope of country. It is unfortunate that most of the people who could have given the history of cutting in the Basin in the early days have died, hence most of the historical information will have to be taken from the story as told by the trees themselves.

Several possible experimental forest areas have been examined. None appear to contain everything that could be hoped for but a final selection of an excellent area can no doubt be made by the Regional Committee this coming winter.

Range Management

Spring-fall Range Studies

The U. S. Sheep Experiment Station at Dubois, Idaho, cooperator with the Intermountain Forest and Range Experiment Station on spring-fall range studies, once again received favorable recognition at the National Ram Sale recently held in Salt Lake City by emerging with sales records which were considerably higher than the 1930 average received by other entries. Although the current depression forced ram sale prices 50 per cent below the 1929 averages the Sheep Station was able to sell a number of Rambouillet and Corriedale rams for values only 20 per cent below the fair prices of last year.

A comparison of 1929 and 1930 prices, with the U. S.S.E.S. sales figures isolated, clearly indicates the premium which sheepmen are willing to pay for the Sheep Station stock, even in times of depression.

Average 1930 prices by breeds for all rams and for U.S.S.E.S. rams compared with average 1929 prices for all rams, National Ram Sales.

	1929	All rams 1930		U.S.S.E.S. rams 1930	
	Av. price for all rams	Av. price for all rams	Decline in price since 1929 (per cent)	Av. price	Difference between 1929 prices of all rams (per cent)
Rambouillet					
Stud rams in pens	$ 65.15	$ 41.71	36	$100.00	+ 53
Corriedale					
Stud rams	119.40	63.25	50	100.00	- 17
Range rams	64.66	31.00	50	37.50	- 42

Pickford spent the greater part of August working up a preliminary report on the survey of protected and grazed areas on Utah's spring-fall range. Roughly, three-fourths of the range of this type in the state was covered by the survey.

Thirty-three protected plots, indicating the original forage cover, were studied in the survey. One hundred and eleven plots were studied on the grazed range, representing present forage conditions.

A comparison between the protected and grazed plots shows a 33.3% higher density and 133.6% higher forage factor on the protected plots. Perennial grasses, which were the chief forage of the original herbaceous cover, are 233.2% greater in amount on the protected plots and on the grazed plots have been replaced to a great extent by sagebrush, Artemisia tridentata, and weeds of low palatability.

Rodent Damage to Range Grasses

Range grasses on summer range on the Wasatch Plateau during this grazing season have been damaged severely by rodents, chief of which are chipmunks, striped squirrels and gray ground squirrels. The damage, which consists of the seed stalks being cut off and either left on the ground near the plants or cached away, occurred during the period of ten to fourteen days preceding seed ripening. The cutting of the seed stalks before the seed ripens is of serious consequence since it defeats natural reseeding of the grasses.

Rodent damage is a factor that must be considered more and more in range management. The ultimate value of such grazing practice as the deferred and rotation system which is dependent upon seed ripening of the range grasses may be greatly impaired. Partial control of

the rodents has been attained on local areas by the use of poisoned grain.

Seed Studies of Native Plants

Studies on seed production and the germination of seeds of a number of important range plants of the Wasatch Plateau region have been continued this summer by Miss Sylvia M. Griswold, graduate student of the University of Chicago. Included in the number of plants studied are 12 grasses, 12 tree and shrub species and 30 herb species, some of which are common weeds and some palatable forage plants. This has been a good year for the germination of both grass and weed seeds and the growth of seedlings. Heavy rains during August brought forth many seedlings of a number of herb species and of some grasses.

Damage by field mice and chipmunks was found not to be confined to the grasses alone, but includes also a number of weed species such as Agastache urticifolia, Agoseris pumila, Gilia pulchella and Valeriana edulis.

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INTERMOUNTAIN FOREST AND RANGE EXPERIMENT STATION (September)

General

Junior Range Examiner Kenneth Pearse left on September 23 for six months' leave without pay to do graduate work at the University of Chicago.

Influences

Utah Floods

The recurring floods in Utah during 1950 have caused Governor Dern of Utah to appoint a Commission "to study the origin and cause of floods and to ascertain whether or not flood prevention measures are advisable." Governor Dern requested Director Forsling to be a member of this Commission along with eight engineers, two geologists, two stockmen, a banker, a farmer, a botanist from the American Smelting and Refining Company, a free-lance conservationist, and an associate professor of forestry from the Utah State Agricultural College. Sylvester Q. Cannon, former city engineer of Salt Lake City, is chairman of the committee. In appointing this Commission the Governor stated as follows: "All phases of the problem should be subjected to the most careful scrutiny and scientific study. ****** I trust you will recognize the importance of this work which possibly involves a permanent state conservation policy....."

This Commission has made a number of field trips over the watersheds where some of the worst floods have originated and over the areas devastated by the floods. Several other meetings have been held to outline a report on the causes and recommendations for flood control and prevention. Not a single member of the Commission who was over the watersheds and saw their condition has raised a doubt regarding the contribution of plant depletion and denudation of parts of the watershed to the floods.

Assignment on the Commission of representatives of the Intermountain and Utah Experiment Stations has necessarily delayed making public any of the findings in the joint studies being carried on by the two Stations. However, work with the Commission will make it possible to secure far greater recognition of the relation of plant cover to erosion and run-off than otherwise would have been possible. It is anticipated final report and recommendations of the Commission will be made in October or early in November. Following this a more technical report on the relation of vegetation to the floods and erosion will be made ready for publication by the Intermountain and Utah Experiment Stations.

Boise Erosion Project

Director Forsling, Dr. Stewart and Collaborator Bailey, Professor of geology at the Utah Agricultural College, spent four days with Renner in making a preliminary examination of the geological and soil characteristics of the South Fork Region. The silt deposits in the Arrowrock reservoir were examined in some detail. The deposits strongly indicate that although some of the material now in the bottom of the reservoir has merely sloughed in from the sides of the reservoirs in steep places, most of it has actually been transported from distant parts of the watershed.

Following this trip, Stewart and Renner spent ten days in securing representative soil samples from areas on the Boise and Payette Rivers, on the Boise, Sawtooth, and Payette Forests. In company with Assistant Regional Forester Woods and Supervisor Benedict, four days were spent on an inspection of certain Sawtooth sheep and cattle ranges. As compared with adjoining ranges on the Boise it is the opinion that the Sawtooth ranges s.on have experienced but little erosion. Except in the vicinity of driveways, practically no gullies have appeared. However, sheet erosion is in evidence over wide areas and much of the country appears to be on the verge of giving way to heavier erosion. Just why the Sawtooth ranges should have stood up better than the adjoining ones on the Boise is not definitely known as yet. Rate of stocking may be a factor. However the native rock on the Sawtooth appears to be somewhat harder and weathers down to a soil with better binding qualities, it is difficult to believe that these physical

differences are sufficiently wide to account for the lesser degree of erosion to date on the Sawtooth ranges. It is hoped that the analysis of the 130 soil samples collected will afford a clew to this important problem.

Range Management

Effect of Prolonged Heavy Rains on the Vegetation

Practically every growing season in the Wasatch Plateau region appears to have individual characteristics. This year the forepart of the summer was quite dry and vegetation began to mature early. Then, during the period July 30 to August 17 inclusive, there was heavy rainfall, a total of 4.95 inches falling at the Great Basin branch station. There were only two days in the period of 19 days when no rain fell. Growth of the grasses had practically ceased before these rains started and the seed was fast ripening. The rains delayed seed ripening until August 20 to September 1.

The wet period resulted in extensive regrowth of the range grasses that had been grazed earlier in the season. Measurements made September 20 showed an average regrowth of 2.40 inches for the many-flowered brome (Bromus polyanthus) and violet wheatgrass (Agropyron violaceum). This aftermath has furnished considerable more forage for range livestock.

Seed of grass and sweet clover sown on the artificial reseeding areas in the oak zone in May and June lay dormant until the August rains. Since then a splendid crop of seedlings has been produced which has made substantial growth. Good seedling stands of the following native species, violet wheatgrass (Agropyron violaceum), many-flowered brome (Bromus polyanthus), wild geranium (Geranium viscosissimum), stickseed (Lappula sp.) dandelion (Leontodon taraxacum), lupine (Lupinus spathulatus), dragonhead (Moldavica parviflora) mustard (Sophia incisa), meadow rue (Thalictrum fendleri) and American vetch (Vicia americana) were noted on various range areas.

The weather during September has seriously interrupted fall field work. Rain and snow prevailed throughout the month. Eleven inches of snow at the Great Basin branch headquarters and 15 inches at the Alpine sub-station on September 23 and 4 inches additional snow later in the month rendered field work impossible. Some warm weather during October will be needed to melt the snow to complete field work. Otherwise it will be necessary to forego getting certain data. The total precipitation at the various physical factor stations during September was as follows: Oak brush, 3.40 ins., G. B. branch 5.55 ins., and Alpine 3.69 inches. Navigation with motor vehicles has practically ceased.

Forest Management

The period September 12 to September 23, was spent by Watts in company with Mr. E. C. MacGregor, Logging Superintendent for the Boise-Payette Lumber Company, in looking over the western yellow pine timber on the Weiser National Forest. This trip will aid materially in defining the place of silvical research in the private land operations in south Idaho, and may ultimately result in a material increase in sales business in Region 4.

During the latter part of the month, Watts initiated the work of laying out a series of so-called snow recession plots. It is hoped that information from these plots will help in answering the question of the relative influence of various types of timber and other cover on the dissipation of the snowfall.

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NORTHEASTERN FOREST EXPERIMENT STATION

General

The month was marked by a reduction in temporary personnel due to the opening of the school year. F.W. Bennett left for graduate work at Yale, W. U. Garstka received a permanent position as instructor at Penn State Forest School, J. C. Sammi returned to his teaching work at Syracuse, while Ray Daley and G. W. Genth left for new jobs at the Appalachian and Southern Stations, respectively. There will be no difficulty in completing the field work which still remains to be done this season with the force still left.

During the month we were aided by Bert Lexen of the Washington office. Lexen's time was divided between remeasurement of old permanent methods of cutting plots in the spruce types, work on some of the gipsy moth plots in white pine types, and the establishment of the new experimental plots on the Cherry Mountain area.

Behre and Miller attended the summer meeting of the New York Section of the Society of American Foresters in Chenango County, New York. The principal feature of this meeting was the demonstration of a tree planting machine which is being developed by a private concern in cooperation with the New York Conservation Department. A one-row planter drawn by a team of horses, and a two-row planter to be used with a tractor, have been built and tried this year. The two-row planter will set between 3,000 and 4,000 trees per hour at a cost of approximately one-fourth of the cost of hand planting. The machine is able to negotiate fairly rough and steep ground, and will go right through brush up to 2½ inches in diameter without serious interference with the planting. Although still in the experimental stage, this machine has distinct possibilities for the future.

Forest Biology

Early in September Mr. J. Paul Miller reported for duty at this station from the Biological Survey. Miller's appointment is in the branch of Food Habits Research, and he will devote himself primarily to a study of the relation of moles, of mice, and other forms of life to the white pine weevil in the hope that partial control of the weevil may be developed from this line of investigation. Miller has been in the field with Doctor MacAloney for a couple of weeks becoming acquainted with conditions in the region, and habits of the weevil.

Growth and Management of Spruce

Work on the new methods of cutting and slash disposal plots on the Cherry Mountain area of the White Mountain National Forest has been nearly completed. There still remains some measurement of heights and tally of reproduction. These plots total fifty-three acres in area. Sale of the timber from this unit will not be made this year, so that cutting will be postponed for some time.

Sammi and Garstka remeasured sixty temporary sample plots which were established by Westvéld in 1924 for the study of growth on cut-over lands in the spruce flat and spruce and hardwood types in the vicinity of Long Lake, New York. Westveld also succeeded in relocating and remeasuring ten of these old plots near Errol, New Hampshire, and hopes to find and remeasure others on the slopes of Mt. Osceola, New Hampshire. The original data from these plots together with the current remeasurements will be turned over to J. C. Sammi for analysis as a partial basis for his advanced degree at Syracuse.

Remeasurement of Permanent Sample Plots

Jonson with two assistants has continued with the work of remeasuring the various sample plots established by the Forest Service in 1905 and 1906, and working on the experimental areas established in 1914 for the control of the gipsy moth. During the past month methods of cutting plots at West Rochester, Vermont, and Corbin Park, New Hampshire, and the gipsy moth areas at Franklin and Warner, New Hampshire, were remeasured. On the gipsy moth areas, which total from nine to sixteen acres each, 20% tally of the tree growth has been made. On most of the areas an acre has been selected for cultural treatment and more intensive study. The cultural treatments include pruning, thinning, and weeding in young stands of white pine. On the Franklin area an acre on which white ash was abundant was given special treatment, and on the Warner area intensive plots were established in young stands of red pine. The gipsy moth areas at Warner, New Hampshire, and Westbrook, Maine, offered a good opportunity to compare the development of white and red pines in competition with hardwoods, and the resistance of these two species to ice

damage. A heavy storm during the past winter did considerable damage over a wide strip of New England. In the plantations large numbers of white pines were broken and almost all the young trees showed bark injuries of varying degrees. The red pine, on the other hand, was stocky enough to withstand the ice and shows practically no breakage nor bark injury.

Branch Stations in Research Reserves

Due to administrative changes in the organization of the White Mountain National Forest it appears that excellent ranger stations may be made available to the Experiment Station at both Bartlett and Twin Mountain as soon as we are in a position to use them effectively. Because of this possibility further consideration of improvements on the Gale River Guard Station were postponed. It appears, however, that a connection with the Littleton Water Supply may be conveniently made at the Gale River Station.

A crew of four men spent most of one day planting some six-year old white pine transplants in the blanks of older plantations of white spruce and Norway pine at the Gale River Station. The planting stock was left over from some earlier operations at Gale River, and although of poor quality, should be of value in improving the density of the older plantations. Behre spent another day on the Bartlett area with Ranger Spinney examining areas where fuelwood cuttings have been made in recent years, and discussing plans for the management and re-survey of the fuelwood areas. It appears unlikely that we will want to retain permanently that portion of the Bartlett Watershed east of Bartlett Brook.

The search for suitable area for natural areas on the White Mountain National Forest has been continued this summer. There will be no difficulty in establishing a suitable area in the spruce slope type, but virgin stands in typical spruce hardwoods are not common. Behre examined a small area on Martin Brook in the Wild River Drainage with Ranger Hale. Although the exact limits of this stand were not determined, the uncut area of the desired type probably does not exceed forty acres in extent. It runs strong to northern hardwoods, and much of it would be classed as such rather than spruce and hardwoods.

Westveld and Behre examined a virgin area owned by the Parker-Young Company near Lincoln, New Hampshire, which might be acquired or set aside by the Company under cooperative agreement if it seemed desirable. This area is on the slope of Loon Mountain just opposite the town of Lincoln, which was reserved in the early cuttings for sentimental reasons. The stand varies from pure and mixed hardwoods through hemlock and hardwoods and spruce and hardwoods to spruce slope. On this slope abundance of hemlock was quite unusual, and the area in more typical spruce and hardwoods did not seem extensive.

Consultation with Mr. Van Alstine, in charge of the survey crew which has started to revise the management plans for the White Mountain Forest this summer, indicated that two areas suggested by E. D. Fletcher on the southern end of the Forest might be very satisfactory. In a valley known as the Bowl east of Whiteface Mountain 354 acres were mapped as old growth spruce. Anything running over 50% spruce is classed as spruce in the management survey. This type included considerable quantities of white and yellow birch, hard maple, and beech, and extends from about 2300 feet to 3200 feet in altitude. Further east, on White Face Brook, is an area of 113 acres which was tallied as old growth spruce and hardwoods. This area contained a higher proportion of yellow birch, hard maple, and beech, and extends from 2400 feet to 2800 feet in altitude.

On Whitin Brook several areas of old growth of spruce and spruce and hardwood at elevations from 1700 feet to 2000 feet were recorded. These elevations would appear to be more favorable for typical spruce hardwoods type than those indicated for the Whiteface areas. These areas will be examined at the earliest opportunity.

Pathology

Doctor Spaulding completed his field work on the study of deterioration of birch by going back over some of the areas analyzed this summer during the time when Armillaria was known to be in the fruiting stage. Doctor Spaulding also examined some of our old permanent sample plots at West Rochester and Sherburne, Vermont, in the course of a reconnaissance trip preliminary to a proposed study of decay in balsam. Late in the month Doctor Spaulding left for the Appalachian territory for some co-operative work with the men at the Appalachian Forest Experiment Station.

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NORTHERN ROCKY MOUNTAIN FOREST EXPERIMENT STATION

Early in September Gisborne participated in a second test of railroad spark arresters arranged by Regional Forest Inspector John McLaren. In this test a comparison was obtained of the live spark passing proclivities of the Cyclone Spark Arrester, which uses no screen, and the Master Mechanic Front End Arrester which uses a 7x7 mesh screen with openings about 0.10 inch square. On a 97-mile run out of Missoula with an 80-car freight train and two engines, equipped with the two different arresters, but both burning the notorious spark-throwing Rosebud coal, numerous live embers registered their burned record in the test boxes two, three and four cars back of the Master Mechanic Arrester, while not a single burned spot appeared in similar boxes back of the Cyclone equipped engine. A report on this test is being prepared by Mr. McLaren.

All fire weather measurements at Priest River were terminated on September 20 when a light rain following a few days after a heavier one rather definitely terminated all fire danger in that vicinity for the 1930 season.

At Major Kelley's request Gisborne prepared a comparison of the past season with those of 1929 (critical) and 1927 (relatively easy), which brought out, among other things, the following facts:

	1930		1929		1927	
	Clear cut area	Full timbered area (1)	Clear cut area	Full timbered area	Clear cut area	Full timbered area
No. of days when fire would spread	108	63	135	127	74	52
Average	86	131	131 (2)		63	
Lowest moisture content in 2" diameter slash	5%	12½%	5%	12%	7%	13%
No. of days at or below 7%	28		75		7	
No. of days at or below 13%		9		38		14

(1) The timbered station was moved this year to a stand more dense than that previously occupied and thereby affected this comparison.

(2) Measurements were discontinued at Priest River when rain brought temporary safety on Sept. 23, 1929. Later dry weather resulted in fire danger, however, even into November, but no measurements are available.

It is obvious from this comparison that at the peak of the season this year, when the fuels were at their driest, there was no appreciable difference from the peak in 1929, and that the dryness was only a little worse than the peak in 1927. But the driest conditions of 1927 prevailed four times as long in 1930, and nearly eleven times as long in 1929. Here, apparently lies the principal difference between easy and bad seasons insofar as two-inch diameter slash is concerned. The duff moisture records likewise show only small differences between the peaks of these three years, but they show a fire season lasting 23 days longer in 1930 than in 1927, and 68 days longer in 1929.

This comparison, based only on the Priest River records, cannot be applied definitely to the Region as a whole, but from the duff hygrometer reports received from four other stations, on the Clearwater, Flathead, Lolo and Bitterroot Forests, it appears that the Priest River record is a reasonable average. The important feature is the practicability and clearness of a rating based on fuel moistures as compared to a rating based on rainfall, temperature, humidity, wind, sunshine, and evaporation. The effects of all of these factors are included in the comparison of fuel moistures, but when the atmospheric factors are used alone it is impossible to arrive at a clear cut conclusion.

If such comparisons of seasons are desirable for the entire region many more stations must be established and they must be operated with great care from before the opening until after the close of each season. We have developed a method of measuring the moisture content of any size of slash wood, which appears to be much simpler and more accurate than the hygrometer method of measuring duff moisture, but because we do not know the exact effects of moisture on wood inflammability we cannot distinguish the six zones of inflammability which are possible by the duff hygrometer method.

Haig and his crew spent the first part of September on the Clearwater Forest remeasuring semipermanent yield plots and the latter part examining cone crops, seed traps and reproduction quadrats at the Priest River center of work. Field Assistants W. D. Miller and G. M. Jemison returned to Yale and Idaho Forest Schools, respectively, during the month. One temporary assistant, G. M. Fisher, who is staying out of school a year, remains to help Haig with the fall field work.

Another field trip in the interest of locating experimental forests was made by Weidman. Together with Haig several long days of hiking were spent in scouting three proposed sites on the Clearwater Forest. An area embraced in the drainage of Pine Creek near Bungalow Ranger Station meets the requirements quite well, at least much more satisfactorily than any of the five areas examined on this Forest during the past two years. The drainage embraces about 5200 acres lying between 2800 and 4800 feet elevation and flanked by Orofino Creek about 4 miles above its junction with the Clearwater River. The timber is typical of the average thrifty, young white pine forest conditions of the Clearwater region.

Age classes on this area are distributed approximately as follows: 3700 acres in 100-year-old timber, 500 acres in virgin forest, 600 acres in 40-year-old stands, and 400 acres or less in burn about 15 years old. It was gratifying to find a preponderance of 100-year-old timber, as this is the rotation age for white pine at which cutting will take place in the not distant future when

virgin stands are cut out. It has been very difficult to find areas satisfactorily stocked with this age class, which at the same time meet other requirements as to younger age classes, accessibility, diversity of site, exposure and type conditions, etc. So far as accessibility is concerned the Pine Creek Area is located directly on a good Forest road 20 miles from the town of Pierce, Idaho.

As in the case of numerous other areas examined and considered for experimental forests in various parts of the region, this one also offers obstacles to prompt selection. For one thing, it contains a school section and also about 400 acres of patented timber in forties and lots along Orofino Creek which almost entirely exclude frontage of Government land on this stream. For another thing, the vast private timber holdings across Orofino Creek embracing nearly a township will probably not be opened up by the operating company for 15 years, and timber ownership here is such as to shut out effectively the small operator under ordinary timber sale conditions. It is hoped these obstacles can be overcome, however, in the one case by acquirement of the school and private land, and in the other by reducing the stumpage price to almost nothing on early sales for experimental purposes, so that an operator may be induced to truck logs 20 miles to a small sawmill located near Pierce. Measures of this sort will be justified in order to get cutting experiments started promptly in 100-year-old timber in the Clearwater region.

On his return from the Clearwater Forest, Weidman stopped off at the University of Idaho in Moscow to see Dean Miller and Mr. Kempff of the Forestry School. The Dean has just concluded the selection of an area for a school experimental and demonstration forest in the Palouse Division of the St. Joe National Forest. The area was carefully chosen after conferences with Weidman and members of the Regional and Supervisor's offices beginning about three years ago. It fits admirably and without duplication of Forest Service areas into a broad regional program of experimental forests. The school area is representative of a fairly sizeable portion of the white pine type lying west of the National Forests and midway between the proposed Coeur d'Alene and Clearwater experimental areas being selected by ourselves. This is in the Palouse section of loess soils and in that respect quite different from National Forest conditions generally. The area is about 5000 acres in extent and situated on the new North-and-South Highway. The largest part of it is National Forest land, a portion is State land, and the remainder is private timber land, which, it is hoped, can be acquired through the efforts of a well known private benefactor of forestry who is interested in the project. A long term special use agreement has already been drawn up between the State and the Forest Service for the National Forest land involved. Dean Miller plans to make small timber sales and establish permanent sample plots in methods of cutting, thinning, and yield. He also contemplates starting at an early date demonstration areas along the roadside to illustrate cutting, thinning, slash disposal, and other forestry practices.

Thompson collected seed of various species on the Priest River experimental forest in response to the request from the Branch for seed to send to European forest experiment stations. The cones collected include five bushels of Douglas fir, three bushels of lodgepole pine, one bushel of Engelmann spruce, and one bushel of white fir. In addition, he collected a quantity of hemlock and cedar seed for Savenac Nursery. The Regional seed extracting plant on the Kaniksu will extract the seed for us. In order to have Douglas fir and lodgepole pine seed from several other typical localities in Region 1 for the foreign requests, we are securing collection through co-operation of the Office of Planting.

During the ten days that Weidman was at the Priest River Branch in September the Station acted host to an average of more than a visitor a day. These included Mr. Calvert and Mr. Crombie of the Weather Bureau, Dr. Karl M. Müller of the Forest Experiment Station at Munich, Regional Planting Chief D. S. Olson, two Blister Rust representatives and a party of five Priest River business men. The latter were especially invited for a show-me trip. A similar show-me trip of a group of Spokane lumbermen scheduled for this week was postponed because of rain. It may not be possible now to stage this trip until next spring.

The object of Dr. Müller's visit to America is a most interesting one and serves to illustrate the extreme care with which European foresters now undertake the introduction of exotic species. Briefly, Europe with a poverty of native species, including only three or four conifers and but few more hardwoods, seems to be on the verge of losing its only fir (Abies pectinata) through some apparently uncontrollable disease. We know from our own experience with the chestnut blight what that may mean for a species. To replace Abies pectinata, Bavaria is anxious to find a white fir as similar to it silviculturally as possible, and at the same time one that it can be absolutely sure will be adapted climatically. By their experience with species of white firs from various parts of the world in experimental plantations and in the Experiment Station arboretum at Munich, where the fir plantings are over 35 years old, Bavarian foresters have found Abies grandis from America best suited to their purpose. Abies concolor does not thrive so well.

But the mere fact that A. grandis is the tree they want is not the end of the story. European foresters have learned that America is a vast country with extreme differences in climatological conditions even within the range of a single species like A. grandis. In Bavaria where they have late frosts, they would not, for example, want to get white fir seed from the mild and humid region west of the Cascades. They recognize climatic races of white fir, not only the obvious ones of the humid and arid climates, but also the possibility of others throughout Oregon, Washington, Idaho, Montana and British

Columbia. To hunt down the best possible climatic race of A. grandis to meet the needs of Bavaria and southern Germany, Dr. Müller is now spending five months on this mission alone in the Pacific Northwest. For the northern Rocky Mountain region, Weidman outlined for him an itinerary including eight representative localities in which to study the species, including the Priest River Station, where he made his first stop of three days.

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PACIFIC NORTHWEST FOREST EXPERIMENT STATION

Western Yellow Pine Growth Study

Field work in the growth and yield study of western yellow pine has apparently come to a close. Unless further complications set in, the data on hand are adequate. Three summers' field work in the central and eastern portions of Washington and Oregon yielded a mass of data which will keep the computational assistants at full speed for the greater part of the winter. The following constitute the main entries in this original data together with their prospective uses:

1. 173 temporary plots in selectively cut stands, ranging in size from 1 to 5 acres, in age of cutting from 10 to 62 years, in heaviness of stand from 500 to 20,000 board feet per acre, in site from Quality V to II, in location from the California line to the Canadian line. Each plot has its stand map showing the positions of each tree and stump and the groups of reproduction. Each tree is described in all terms which are thought to have a bearing on its growth. There are, therefore, 280 acres of plot maps, 5670 described and bored trees, 8084 measured borings, from which growth tables can be drawn up for the prediction of future volumes in selectively cut forests.

2. 84 even-aged plots to furnish a good basis for checking Behre's yield tables, if not for building up a new table. Of these 84 plots 21 represent a slightly modified condition, since they were taken on cut-over lands, which originally may have had a certain amount of residual stand.

3. 727 sapling analyses for the determination of the necessary number of years to attain 1-foot and 4.5-foot heights.

4. 175 full stem analyses of trees which were released after cutting to show the relative differences in released growth at different elevations up the stem. The majority of these trees were climbed.

5. 15 strips covering 128 acres, each mapped in detail, to furnish a partial basis for bridging the gap between the growth data as obtained on plots and conditions as found on extensive areas. For this same purpose the 280 acres of mapped plots used in the methods of cutting will also be used.

Numerous other lesser items such as the taper analyses of small sizes for use in the extension of volume tables to these sizes, reproduction counts, and general observations and descriptions complete the mass of field data. When it is considered that the calculations involve handling each tree separately, it is easy to see that the amount of computations is enormous covering diameter growth, basal area growth, height growth, cubic foot volume growth, board foot volume growth, individual tree growth, plot growth, development of the seedling and sapling stand, and so forth.

Douglas Fir Slash Disposal

During the month McArdle and his assistant brought up to date all of the major slash disposal computations and all past computations were checked. New features of these measurements are an analysis of the total surface area of the logs in relation to the total volume, and an analysis of bark fall. The latter item is measured in relation to logging, following logging, removed by burning, and following burning. The purpose of these measurements is to relate the amount of bare wood surface exposed with the inflammability of the slash material (since fire behavior studies show that logs without bark burn when logs with bark do not), and also to learn how inflammability may be increased when fires dry the logs and promote the sloughing off of bark. One plot which had been burned was remeasured. On one plot having 13,548 cubic feet of log slash per acre (unusually heavy slash due to a large amount of sound material being left - 80,000 ft. b.m. of sound material per acre, according to J. S. Boyce, who examined this plot), the slash fire removed only 1926 cubic feet (14 per cent) but a cordwood operation subsequent to the slash fire has taken out 8283 cubic feet (61 per cent), leaving only one-fourth of the original log slash volume. The heaviest slash so far encountered had log material at the rate of 28,000 cubic feet per acre; the average for the region probably is around 8,000 cubic feet per acre. To check the numerous sample measurements of moisture content of slash material, a dozen or so sections of limbwood of assorted sizes were weighed and placed in an open area at the Wind River Branch.

Fire Studies

Going Fires This has been a "poor season for studies of going fires, but during the month McArdle visited three large fires. On one fire he had an opportunity to observe the tractor-drawn plow in operation. Following the development of the tractor plow by the

Forest Service of R-6 for the yellow pine types, the Washington State Forestry Department and the Washington Forest Fire Association each obtained a tractor and plow and have been using this equipment during the season now ending in the Douglas fir types. On the State and Association equipment the beam of the Killefer plow has been strengthened greatly by welding on considerable iron, and instead of a rounded point on the plow (as developed by the Service) there is the usual sharp point but this is protected by a heavy bar with a sharpened edge which slices through roots up to about 4 inches in diameter. McArdle has seen the plow in operation in a repeatedly burned slash area, in brush, and in a typical stand of second-growth Douglas fir about 100 years old. The concensus of opinion concerning these plows is that they are an advantage over hand labor if the slopes are not over 30 per cent and if there are not too many logs on the ground. It is believed that the "Fifteen" Caterpillar tractor is too small for these plows and also should have the tracks spaced further apart to prevent slipping on the hillsides.

Statistical Study

McArdle had several conferences with Grefe and with Brundage concerning the proposed analysis of R-6 fire reports. It is planned to begin this work sometime next month. This region is fortunate in having a complete tabulation of all fire report data for many years, which will greatly simplify the labor involved in making these analyses.

Railroad Fires

A matter recently has come to our attention which merits considerable thought on the part of all who have to do with fire protection. Those who have not read the Wallace report on the fire-starting propensities of locomotive sparks (see review in the Journal of Forestry for November 1928) should do so. This report represents a serious attempt to discredit the statements that the various protective agencies have made concerning the part played by the railroads in causing forest fires. In response to a recent request for information we were able to find only one instance in this region where the fire report clearly indicated that a locomotive spark started a fire. If we are to continue to attribute a large number of our fires to railroad operation, we certainly shall have to obtain more careful and detailed data on these fires. Thus far we have very little evidence which would stand a lawsuit test.

Weather and Inflammability

To measure the seasonal progress of fuel moisture content, McArdle has prepared 68 sticks of Douglas fir sapwood and these are now being calibrated at Wind River. Charts for reading moisture content directly by weighing the sticks have been prepared for all of these specimens.

Static

Early in the month Simson revisited the central dispatcher headquarters at Summit Meadow, Bend, Lakeview, and Sumpter where experimental static meters are installed. He found the meters functioning, with the exception of the one at Bend which was not operating due to a defective vacuum tube. By next spring the new 2-volt tubes will be on the market and will be substituted for the present -99 tubes. The new tube is much more rugged than the present model. Preliminary reports from the dispatchers indicate the meters are responding to thunderstorms 40 or 50 miles distant.

Forest Insurance

During September, with H. J. Stewart assisting, H. B. Shepard made detailed damage studies of three burned areas as follows:

1. Bear Creek fire - September 1928 - 3000 acres. This fire burned mainly in recent cut overs not yet restocked and in typical fern areas but yielded some useful data on an area of about 300 acres where it killed a well-stocked stand of Douglas fir reproduction about 15 years old. This fire also demonstrated quite effectively the fire resistant character of dense second growth stands 25 to 35 years old when clean of debris. Four days of field work were spent on this fire.

2. Deep Creek fire - September 1929 - 2500 acres. Near Sandy, Oregon. This fire burned in unrestocked cut overs and old burns, somewhat in virgin old growth, and considerably in a 50 year old stand of second growth Douglas fir, most of which was completely ruined, even the larger firs being killed to a surprising extent. This fire was, however, somewhat unique in that most of the boundaries are cleared fields. Five and one-half days of field work were spent on this fire.

3. Eastern and western (Silver Falls) fire - September 1929 - 21,000 acres. This fire burned in recent unrestocked cutovers, virgin old growth, and 35 and 75 year old second growth, also somewhat in typical fern areas. Data on this fire are still in crude shape though the field work, which occupied 11 days, is completed. The material furnished will unquestionably be significant, partly because of the opportunity afforded to observe the effects and circumstances of crown fire in old growth, and partly because the fire burned through considerable areas of second growth with varying effects.

The time shown as devoted to the other three fires was slightly broken into by reconnaissance of small fires near them which resulted in the conclusion that they do not offer good opportunities for detailed examination. Evidently the best economy will be achieved if we direct our attention to the fires 500 acres and larger that are reasonably easy of access.

Natural Reproduction of Douglas Fir

During September Isaac spent considerable time at the Wind River Branch Station making the final seedling check on the grazing and natural reproduction transect, making the first periodic collection from the seed traps and dismantling the instruments on the physical factors and reproduction study. The closing of this study marks the end of the most severe season, as far as seedling survival is concerned, during the four years that this study has been under way. The survival of 1930 seedlings on the area is in the neighborhood of one per cent. However, this area is a more severe site than the average.

Cooperation with Biological Survey

After some conference in the office regarding studies of mammals in relation to silviculture, Mr. T. H. Scheffer of the Biological Survey's research department with headquarters at Puyallup, Washington, accompanied Kolbe and Kummel on an inspection tour of the Hebo planting area on the Siuslaw Forest as a preliminary step in cooperating with the Station. He was shown the two growth and yield permanent plots in an 18-year-old Douglas fir plantation on which over 5 per cent of the trees showed some damage by mountain beaver. At the time the plots were located much difficulty was experienced in finding an acre area in this planted stand that did not have a number of open spots. On an examination of a number of these areas, Mr. Scheffer felt quite certain from evidence on the ground that mountain beaver is primarily responsible. Plans for cooperative work have not as yet been made, but it is understood that an effort will be made early this spring to help us in our control of rodents in the direct seeding study and in plantings.

Forest Survey

Dr. Boyce Holds a School of Defect

Members of the Forest Survey staff from Portland, together with Holst from the Cascade, McReynolds from the Umpqua, and Lachmund from the Office of Forest Pathology, visited the timber sale at Westfir on the Cascade National Forest last month, where they met Dr. Boyce, formerly with the Bureau of Plant Industry in Portland and now a professor at Yale. Supervisor Thompson of the Cascade and F. A. Davis, in charge of the sale, were also present. A school of instruction for the determination of defect in standing timber was held and this area proved to be a good laboratory for such a study. Whenever the condition of a standing tree was not agreed upon by everyone present, down came the tree with Girard and Thompson taking first honors with the axe and saw. The head bucker for the Company even offered to put some of the crowd on the pay roll. In addition to felling and bucking questionable trees in the woods the party followed several defective logs through the mill. Everybody present improved his technique in recognizing defect in standing timber.

Stocked Quadrat Method of Classifying Stocking

There has been much discussion in the office as to the technic of determining the degree of stocking of cut-over lands, both those in which the reproduction, if any, is of seedling or sapling size and where it is of pole size. The time-honored system of gauging stocking by number of trees is very unsatisfactory because it fails to express distribution. Accordingly it has been decided to adopt what may be called the stocked quadrat method. By this method the area under examination may be assumed to be divided into squares of such a size that the presence of one tree per square indicates satisfactory stocking. The size of the squares should, of course, be gauged to the age of the reproduction being considered, but for the purposes of the Survey project but two sizes are being considered, namely, for established seedlings, saplings, and poles up to 8 inches in diameter the squares will be 13.2' x 13.2' (1/250 of an acre), and for material larger than that up to merchantable size the assumed quadrats will be 20.9' x 20.9' (1/100 of an acre). Very young seedlings which are not considered established will be counted the equivalent of 1/3 of an established seedling.

By this technic it will be assumed that if 70 to 100 per cent of the squares each have at least one seedling, the area is well stocked. If 40 to 70 per cent of the squares carry a tree the land is mediumly stocked. If 10 to 40 per cent, poorly stocked, and if less than 10 per cent of the squares contain a tree, the land is classed as nonstocked. It must be borne in mind that the number of seedlings per acre will be several times the number of quadrats that carry reproduction, because many quadrats will have several trees upon them due to the inevitable and universal patchiness of natural reproduction. But we are not interested in the total number of trees per acre, but in the proportion of the land that carries enough trees to insure full use of the soil and light by the time the stand should close.

The technic of making such a count in, say, 15-year-old logged and burned land whose degree of stocking can not be determined by casual inspection is quite simple. It is devised for one man working alone. He paces a chain and stops. He then is at the common corner of 4 squares and observes for each square whether or not it contains a seedling (or sapling or pole, as the case may be). If he sees one on a square he counts no further and most of the time will not even have to accurately measure the square. In actual procedure he will note down the number of squares that are stocked as 0, 1, 2, 3, or 4, rather than make a tally for each square. In compilation the 4 quadrats taken for each of a string of 3 chains will be grouped together in computing the degree of stocking for that portion of the strip. The office work by this method is exceedingly simple.

Status of Field Work

Field work for all private lands in Washington, Clatsop, Columbia and the north two-thirds of Tillamook counties has been completed. Starting the first of October, field work will be begun in Yamhill, Polk, and Benton counties, Oregon, and Cowlitz county, Washington. The first national forest to be completed, so far as field work is concerned, is the Siskiyou which is being done by Forest Examiner Henry Haefner.

Forest Survey Personnel

Mr. Percy Pratt, well-known local timber cruiser, joined the staff of the Forest Survey early in September as a timber expert having qualified under the examination for that grade. Pratt was formerly with Pearson and Grady, local timber cruising firm in charge of a survey of the timber of western Oregon being made for a large corporation.

Mr. C. W. Kline, a logging engineer of Coquille, Oregon, graduate of the University of Washington, and formerly a forest assistant on national forest timber surveys has also accepted appointment as timber expert and commences his duties in a few days.

Mr. Woodbury of R-5 and Mr. Wieslander of the California Station paid us a visit the end of the month to study Forest Survey methods and type mapping problems as they relate to both districts. The interchange of ideas seems to be mutually beneficial.

Munger gave a short talk at the September meeting of the Forestry Committee of the Chamber of Commerce on the Forest Survey. This meeting was staged to explain local forest activities to the Congressional Delegation, only one of whom, however, was present.

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SOUTHERN FOREST EXPERIMENT STATION

General

During the early part of September, most of the men from the New Orleans office were in the field. Demmon attended two erosion control demonstrations in Mississippi, and at that time arranged for cooperation with State Forester Merrill on a proposed hardwood study.

Two new men joined the staff: Dr. Robert K. Winters, Assistant Silviculturist, who has been assigned to silvicultural studies in the bottomland hardwoods; Gustav W. Genth, Field Assistant, who comes to us following similar training at the Northeastern Forest Experiment Station.

Four new offices have been added to the Station quarters in the Stern Building in New Orleans. Two of these offices will be used by the Forest Survey men; one will be used by the men on the hardwood silvicultural studies; the fourth will be used by the erosion staff.

The extended drought in the Mississippi River basin has caused such a decreased flow of silt-laden water in the river at New Orleans that salty water has been forced in from the Gulf. This clear, almost currentless water presents a marked contrast to the usual turbulent muddy appearance of the Mississippi.

Mensuration

Meginnis, Cruikshank, and Genth spent a week gathering data in connection with a proposed longleaf natural area adjoining the Kisatchie National Forest purchase unit. A fine stand of virgin longleaf pine on two sections of land was cruised and a map made of the area. The longleaf on portions of the area examined will run 20,000 to 25,000 board feet per acre.

Forestation

Wakeley and Cruikshank collected six bushels of slash pine cones near Slidell, Louisiana. These cones yielded .65 pounds of seed per bushel. The new "Clipper" seed cleaner was used to clean the seed and yielded the cleanest seed ever handled by the Station. These seed have tested better than 95 per cent sound.

Gemmer, at Camp Pinchot, has started experimental plantings of Eucalyptus pilularis and E. Maculata.

Naval Stores

Regular chipping and dipping work continued uninterrupted throughout the month. Busch has continued the semi-weekly chipping of the trees being worked at Kingsley Lake in cooperation with the Bureau of Chemistry and Soils and the University of Florida. He has also obtained time data upon the chipping of French, various American and split faces, both at Kingsley Lake and upon several groups at Sampson.

Wyman and Heyward spent the entire month on extensive surveys, mostly near the new Osceola National Forest in north Florida. Averell and Rudolf were also assigned to this work during part of the month. Strips were run to determine the effect of a 1927 fire upon the mature trees and subsequent reproduction in a slash-cypress pond. Several areas were examined for unburned stands. Site determinations were made upon various soil series found in the region, to determine whether there is a correlation between quality of site and the soil series. Several

strips were run on the Osceola National Forest to determine the amount and character of damage by hogs to longleaf reproduction. The greatest damage was found in the wetter situations and to longleaf pines under three inches d.b.h.

Several sections of the Osceola Forest which contain stands of slash pine of sufficient acreage to be suitable for experimental work were examined. Advantage was taken of the opportunity to measure and photograph several root systems of longleaf pine which had been pulled up by the road construction crews.

Types

The question of forest types for the Southern Region was again brought up following Dr. Pessin's return from Asheville. Several changes were suggested in the arrangement and naming of the types. Lentz found it difficult to describe some of the bottomland hardwood types on a basis of the accepted moisture classification, and made numerous changes in the lineup of types.

Financial Aspects of Forestry

Dr. Ziegler spent several days at the Washington office in conference with Marsh, Sparhawk and Hunn. The Appling County, Georgia, report has been revised and is ready for mimeographing. The final revised figures for the county show operations in 1929 making 30 units of Naval Stores per crop lost $4.91 per unit; 35 unit crops lost $.21 per unit; and 40 unit crops made a profit of $3.41 per unit.

The Hercules Powder Company of Brunswick, Georgia, is to cooperate with the Station in a study of wood, turpentine and rosin production. This Company uses stumpwood in their distillation work and has several million dollars investment in land and plants in the South.

Bond made a reconnaisance in Manatee County, Florida, and found that one of the largest turpentine and lumber operators in the county is practically worked out. Taxes on cut-over lands not on a highway were found to be 30 cents per acre, and for timberlands not on a highway the tax is 60 cents per acre. Cutover lands in this county are not restocking naturally.

Bond, Spillers, and Reynolds made a study of the operations of the Superior Pine Products Company, Suwanee Forest in Southern Georgia, of which Captain J. F. Eldridge is manager. A case study was also made of Alex Sessom's operation in Southern Georgia.

Following these case studies, Spillers and Reynolds made a county study of Osceola County, Florida, in cooperation with the Florida Forest Service. Two large sawmills were found to have been operating in this

county for about four years, and now neither have more than one year's cut of timber on hand. The timber in which they have operated has averaged less than 1,000 board feet per acre, and the cutting has been clear. Most of the cut-over land is not restocking and is being used for grazing. In 1880, large blocks of land in this county were sold for 25 cents per acre and other areas were given away as bounties to land-owners who drained lands they already owned.

Hardwoods

Winters, at a staff meeting, gave an account of his recent European trip where he visited a number of forest schools and forest experiment stations in England, Scotland, Germany, Norway, Sweden, Switzerland, and France. He was particularly impressed with the absence of American Forestry publications in the European libraries. Even the best-known European forest research organizations have very limited funds at their disposal.

In the maritime pine region of southwestern France, he found that new methods of turpentining are being tried out although no results of large-scale operations have as yet been obtained.

Erosion

Lentz returned to Holly Springs, Mississippi, after spending his leave in Maryland and Pennsylvania. He drove south via Columbus, Ohio, where he had a short visit with McCarthy and Barrett of the Central States Station. Extreme conditions of drought and frequent occurrence of roadside fires were noticed in all the states through which he passed. Kentucky and western Tennessee, along with sections of Maryland, seemed to be the hardest hit.

Cruikshank and Miss Regan traced some of the field maps made by the erosion crew during June and July. Blue-line prints made from these tracings were used in connection with gully reclamation demonstrations in Mississippi.

Sinclair spent the first week in the office, working up crop meter data in connection with the erosion maps. He joined Lentz at Holly Springs and during the week of September 8 they assisted in the gully control demonstrations arranged by D. E. Lauderburn, the Extension Forester of Mississippi, and the county agents of four counties. These demonstrations are the first to be carried on in Mississippi.

Detailed maps of several of the eroded areas were shown by Lentz at these demonstrations, so that those present could better visualize the serious extent of the soil waste. At each demonstration, the boys from the local agricultural high schools were present and took a part.

The demonstrations were held in Benton, Marshall, Panola, and Carroll Counties. These demonstrations showed how brush dams should be built in the gully bottoms and how the gully banks should be plowed off to obtain better conditions for control. The planting of locust is to take place on these prepared sites early next spring.

In Benton County, the soil was so hard and dry that the mule teams could hardly make an impression on the sod, and a ten-ton caterpillar with a heavy road plow was used to plow in the gully banks. This equipment was loaned by the chairman of the Board of County Supervisors and was operated by the road maintenance crew. The attendance at these demonstrations averaged about one hundred each day.

Sinclair and Meginnis covered three more counties with the crop-meter. Carroll County was worked during August, but no percentage figure had been worked out. The counties recently worked and the extent of erosion in each are as follows:

COUNTY	PER CENT OF AREA ERODING
Panola	17
Holmes	23
Hinds	12
Carroll	18

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SOUTHWESTERN FOREST AND RANGE EXPERIMENT STATION

The office of the Southwestern Forest and Range Experiment Station is now installed in its new quarters at the University of Arizona in Tucson. Ten good rooms have been provided in the Agriculture Building, one of the most modern buildings of the University. As far as office work is concerned, the new facilities are a great improvement over what we have had in the past. The field for forest research will be less accessible than in the past. This means that the most must be made of the Fort Valley branch station during the field season. Moving the office equipment and personal effects of the staff from Flagstaff to Tucson has made heavy inroads upon the time for research and upon the already deficient appropriations.

An additional experimental forest area for western yellow pine has been tentatively selected in the Long Valley section of the Coconino. This forest if representative of the best site quality of western yellow pine in Region 3. Volumes per acre average between 15 and 20 thousand board feet, as compared with 10 to 12 thousand in the Flagstaff section. The Fort Valley Experimental Forest established in 1929 is representative of the latter type of stands. Organization of this area for experimental work is proceeding slowly because of inadequate funds. One section has been fenced and mapped on a scale of 16 inches to the mile and 10-foot contour interval.

Krauch, assisted by Hornibrook and Osborn, are remeasuring a sample plot of 120 acres at the Fort Valley station. This plot is part of a 320 acre virgin stand which is being retained as a natural area.

Western yellow pine seedlings of 1929 and 1930 germination are fairly abundant in places, though rarely sufficient for satisfactory stocking. The summer rains of both years have been copious, but the seed supply deficient. The seedlings are most numerous in the partial shade of tree groups where experience has shown that few develop normally. As in 1920, the best survival and growth of second year seedlings is in stump patches on which herbaceous vegetation has been held in check by grazing. In 1919 and 1920, the seedlings on stump patches exposed to grazing were completely exterminated. Relatively little such damage has materialized this year, which speaks well for the grazing practice now in effect.

The Timber Growing and Logging Practice report has been revised and will soon be ready for submittal. A number of changes from the 1925 draft have been made in conformance with recent findings of research and administrative experience.

Range Section

Forest Influences

Probably the most important action during the time was the actual establishment of headquarters for the Southwestern Forest and Range Experiment Station on the campus of the University of Arizona at Tucson which grew out of the cooperative agreements entered into with the University earlier in the year. The University has been very generous in furnishing the Station with adequate and attractive space in the Agricultural Building.

In the main, field men are still on project work and will be in the field until early November.

Mr. Clapp paid us a short visit at the time we were moving into the new headquarters.

All possible aid has been given the University in the matter of locating a suitable place for the first of a series of climatic stations, the proposed plans for which were discussed in the April and May reports. The University will equip and man this station. The Santa Rita Range Reserve was the ground examined. Much experimental work in which many agencies are interested is in progress on the Santa Rita Reserve. A primary factor upon which selection of this area rests is the development of an adequate water supply. Cost of water development and as to how it may be financed is an important item in the present scheme of things. The value of such a station to our work on the Santa Rita and in similar zones of life can scarcely be over-estimated.

The idea of a chain of climatic stations representing the primary zones of vegetation in Arizona originated with Dr. Shantz, President of the University. We are, indeed, favored by being able to cooperate with and share the stimulating influence of men like Dr. Shantz.

Study has strongly indicated that water requirements of the animal are related to browsing injury of western yellow pine reproduction. Changes in physical character and composition of forage plants due to cutting of the mature timber and to past over-grazing of the grasses results in a lesser degree of succulence in forage as a whole. A primary influence seems to be that of the availability of stock watering places to the forage supply on plateau regions capped by volcanic formations.

It has now been made possible by 1931 appropriations to attack this problem experimentally. Necessary installations are being made and the range pastures are under construction in preparation for investigation of water relationships next June, the dry period during which the main terminal injury to reproduction occurs.

Four pastures will be used. One set of two are located in forage vegetation undisturbed by grazing intensity while the other set encloses vegetation of a character and density that results from past excessive range use. Both sets of pastures are on cut-over timber lands and within the cattle range used for intensive investigations since 1927.

Water will be kept available at all times to stock in one pasture of each pair. The second pasture will be supplied with water to appoximate the watering habits of the stock on the range proper. Pastures are of sufficient area to supply adequate forage for the steers enclosed.

The differences between plant character and growth in the altered and unchanged states is expected to reflect the influence of degree of succulence of vegetation. Moisture content determinations will also be made for forage plants being grazed at a particular time and also of parts of reproduction browsed.

The pastures will make it possible to study in an intensive manner such plant factors as palatability, habits of animals and phases of carrying capacity.

The major part of the project on management of range in the cut-over sawtimber type has been carried on throughout the grazing season that will close in late October. To this project initiated in 1927 has been added plot work on pine seedlings of 1928 to 1930 germination within the virgin timber stand. This additional work supplements the original project by adding to it determinations on seedlings of the one to four year age class, thus allowing for completion of the records on the influence of grazing throughout the first fifteen years of pine seedling establishment.

Santa Rita Range Section

Rainfall and Growth

Rainfall conditions during the summer of 1930 on the Santa Rita have been so unusual as to give rise to frequent comment and also conjectures as to what might be the influence on growth and density of vegetation. Effective rains started on June 15th and continued until the 21st, totalling 3.22 inches or six times the average amount for June during the last thirty years. Incidentally, this amount exceeds the highest previous amount for June by over an inch. During July and August, 3.22 inches and 4.39 inches respectively were recorded, bringing the total for the summer appreciably above the average. With the early start that growth had (a month ahead of average conditions) conditions seemed ripe for an exceptional forage crop, however, very distinct dry periods, varying in length from five to fourteen days, occurred throughout the summer and even the shortest of these was sufficient to greatly retard growth while the longer ones brought it to a complete standstill so that by the end of the season no more than an average forage crop was recorded. General observations taken during the fall charting of quadrats indicates a very material gain in density of grasses throughout the mesa type, with the foothill type just about holding its own or perhaps slightly gaining over 1929. A summary of rainfall and growth conditions during the past twelve months would indicate that we should have a general increase in density over the Reserve, however, density in the foothills was a bare average in 1929 and very exceptional growth conditions would have been necessary to bring on any appreciable increase in density there.

Cattle and Market Conditions

Cattle are in excellent condition all over the Reserve, and apparently a high calf crop will be recorded. Buyers are scarce with no stock contracted as yet anywhere in this section, although several buyers have written our cooperators requesting that they be given a chance to look at the Reserve cattle.

(Jornada Range Report for August follows on next two pages.)

Visitors during the month were Clapp (Tucson), Chapline, Sherman, and Pooler (Jornada), A. D. Lindsay from the Forestry Bureau of Australia (Flafstaff and Tucson), Calkins and Headley (Tucson.)

Jornada Branch Station Report for August

Progress on Reconnaissance Compilation

Canfield and Stanley completed planimeter work on approximately half of the Reserve and advanced well into the compilation of data. The progress on this uncompleted job is very encouraging, even though the field season will curtail the activity considerably during September. A comparison of the 1928 reconnaissance with that of 1915 is convincing of the dynamic changes in vegetation taking place even in semi-desert habitats. In fact, there has been considerable improvement in many types between 1928 and 1930, as shown by field checks of some of the 1928 write-ups. It is expected that the two grazing survey maps made 13 years apart will show many facts about plant succession in the Jornada region.

Fall Charting of Quadrats

The fall charting of quadrats was started late in the month by the mapping of three major mesquite (Prosopis glandulosa) plots, which were established in 1927. They are mapped on a 3 year schedule, but composition write-ups and growth measurements are made every year. Each year some of the tagged Prosopis twigs are lost through rodent cutting, but representative measurements have been obtained nevertheless. It appears from observations made so far that a large percentage of Prosopis twigs are determinate; that is, a number of the branches have no terminal buds and grow only one season. Most of the twigs grow from 4 to 12 inches in one year, then rest or produce lateral branches for 2 or 3 years, then resume terminal growth. It will take considerable observation throughout the year to put together the full story of Prosopis growth and flowering activity, together with the effect of grazing and rodent cutting.

Manuscripts

The rough draft of Campbell's revised clay soils paper was forwarded to Washington for typing. Since June, the paper has been broadened to include plant succession on all the types of clay soils found on the Jornada.

Canfield's report on the black grama and tobosa grass clipping studies was submitted to the Washington office.

During the first week of September, Roeser was engaged in making the fall cone counts in the seed production studies involving western yellow pine, Douglas fir and Engelmann spruce. In the case of the first-named, the crop was a complete failure, not a cone being produced on the .6 acre plot. However, a high percentage of new cones has survived the first season's development, and augurs well for a heavy crop next fall.

The Douglas fir crop was also a complete failure above an elevation of approximately 8500 feet. In the case of this species, the failure can be traced directly to killing spring frosts which accounted for every one of the relatively small number of flowers produced last spring. At the lower elevations a heavy loss was also incurred because of the cold weather, but a scattering crop of poorly developed cones was collected from each of the trees involved in the study.

The Engelmann spruce crop likewise was quite deficient, but not because of adverse weather during the flowering period. The past season was an "off-year" for spruce, and very few flowers were developed. All in all, the year 1930 goes into the record as one of the poorest seed years this region has experienced since the inception of phenological observations.

Stand measurements were completed on one plot of ridge Douglas fir type within the Fremont experimental demonstration forest and this plot was added to the fifty-six now on the list upon which the preliminary work incidental to putting them under regulation has been completed.

On September 14, Roeser left for Nebraska to spend the rest of the month on projects under study in the Sand hills Center at the Bessey Nursery of the Nebraska Forest. Accompanied by Supervisor Nelson, the first part of this period was given to visiting all of the forty-eight seed trees in the Sand hills, Pine Ridge and Black Hills regions, which have been designated as the parent trees for the western yellow pine planting stock with which it is hoped to develop the best possible strains of this species for planting under Sand hills conditions. This year's collection represents the third from these particular trees. The crop was very light with only twenty three of the trees represented in the collection.

The percentage of weevilled cones seemed to be higher than is normally the case, and it is possible that poor development and extra heavy activity of cone moths are results to be attributed to the extraordinary drought conditions which prevailed all season. Emphasis is given to this theory by the fact that practically every new cone resulting from this year's flower crop was dried-up, and next year's cone crop will be extremely meagre. The extent of the effect of the 1930 drought also upon the next flower crop through inhibition of assimilatory activity constitutes an interesting item for conjecture.

Upon returning to the Bessey Nursery, the work of building a new meteorological station to supplement the three at which observations are now being regularly made in the type study (T-1) was undertaken. This station was recommended for inclusion last winter and approved by the Regional Investigative Committee. Its purpose is to procure a thermometric air and soil record of evaporation and wind movement under open Sand hills conditions in order that these may be compared with similar phenomena where plantations have been established. A site as nearly as possible comparable in topography and exposure to that at Station H-2, which was established in 1917, was selected on an open hill-side southeast of headquarters building. By comparing the record to be obtained at this station with that of the original station, which is now surrounded and overlapped by a thirfty stand of jack pine upwards to 30 feet tall, it is expected that the influence of the stand in moderating atmospheric conditions may be interpreted. A rain gauge was also placed at the old station in order to get some data on the interception of rainfall by the tree canopy by comparing the catch with that of a gauge in the open. The stand immediagely surrounding Station H-2 was mapped as the basis for future studies in changes in environmental conditions.

Time was taken to look over the plantation area thinned last winter mostly in jack and Scotch pine stands. Aside from the obvious silvicultural improvement of the stand brought about by such thinning, and the revenue derived from the sale of pole and brush material, the general appearance of these stands following thinning is such as to gladden the heart of any forester. It is expected that these thinning operations will be continued from time to time as older plantations approach "thinning" size.

Areas representing typical stand conditions in both jack and Scotch pine stands were laid out and given special treatment as to degree of spacing and intensity of pruning, to the end that they may be included in the list of experimental plots planned for this Center. Unfortunately, it was not possible to complete all of the initial work necessary to place these areas on a satisfactory basis from an experimental standpoint, and Research contemplates to undertake this work next year. At the present time, three blocks of thinned plots, including six in jack pine and four in Scotch pine, are available for growth study and are due for their second periodic remeasurement next fall. No plots have, as yet, been established in western yellow pine stands, since natural losses in the oldest stands of this species have reduced their density considerably below what might be considered a normal or desirable degree of stocking.

The tip-moth (Rhyacionia frustrana bushnelli) appears to have been effectively checked by the successful introduction of the Campoplex parasite. Plantations especially hard hit in the past by this predator have made exceptionally good growth this year and leaders 12 to 18" long are common on trees which had failed to gain more than an inch or two in the past several years prior to the release of the parasite. However, with the apparent elimination of the tip-moth as a noxious factor, comes another pest, whose destructive habit constitutes a much more serious menace so far as the economic future of the planted stands is concerned, than that of tip-moth. This pest is a pitch-moth which, ordinarily working at the base of branches on the stem, girdles the tree and weakens it mechanically so that the stem breaks off, leaving a scraggly, deformed individual which can not hope to develop into a pole or timber producing tree. Scotch pine is especially susceptible to this pest but all species are attacked and an increase in its activity in western yellow pine can now be noted.

A representative of the Bureau of Entymology, Mr. Lynn Baumhofer, to whom may largely be credited the success obtained in combating the tip-moth, returned to the Bessey Nursery for a short stay toward the end of September to check up on the work of tip-moth control. It is understood that he has begun the study of the life history of the pitch-moth, and during the period mentioned succeeded in finding the first egg yet to be discovered of this pest. It is hoped that work to control this insect will be undertaken soon and vigorously pushed.

The isolated breeding area of selected stock in the Bessey plantations, which was planned for in the original working plan, was started last spring near Camp 4. A sufficiently extensive area has been reserved to accommodate all the stock which will be raised for this purpose in the next decade or two. Survival in this plantation was rather poor this year because of the severe drought and excessive grasshopper damage. These factors were responsible for the almost complete failure of much of last spring's planting.

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MANUSCRIPTS

ALPHABETICAL

"The Economic Value of Wild Life to the Forests." By T. D. Burleigh, (Address before North Carolina Forestry Association, September 10, 1930.)

"The Relationship of Biology to Forestry." By T. D. Burleigh. (Address before forestry students of University of Georgia).

SOUTHERN

"Man Made Waste Land in Mississippi" by J. D. Sinclair. (Southern Agriculturalist)

"Scientific Principles Underlying the Technique of Streaking Pines," by L. A. Ivanov; Translated by L. J. Possin. (Mimeographed)

"From Forest to Farm to Waste Land in 20 Years - An Erosion Cycle in Mississippi," by G. H. Lentz.

IN PRINT

Forbes, R. D.	Review: Forestry and Coal Mining. Publication of Clearfield Bituminous Coal Corporation. (Jour. of For. May, 1930)
Forbes, R. D.	"Meeting the Issues." (Jour. of For. Oct. 1930)
Gevorkiantz, S. R. and Raphael Zon	"Second-Growth White Pine in Wisconsin," (Res. Bul. 98, Wis. Agr. Expt. Sta.)
Krauch, Hermann.	Review: The Winterkilling of Evergreen Plants during the Cold Spell of January-March, 1929 and its causes. (Jour. For., May, 1930)
Korstian, C. F.	"Acorn Storage in the Southern States." (Jour. For. Oct. 1930)
Roeser, Jacob, Jr.	Review: Forest catastrophies and their prevention. Report of press service for the Prussian Ministry of Agriculture, Lands and Forestry. (Jour. of For. May, 1930)
" " "	Review: The Effect of Soil Exposure of Long Duration upon the Growth of Forest Stands by Han Weck. (Jour. For., May, 1930)
Zon, R. and F. J. Alway	"Quantity and Nutrient Contents of Pine Leaf Litter." (Jour. For. May, 1930)

OFFICE OF FOREST PRODUCTS - Region 1

Growth Study to Furnish Excellent Data on Amount That Can Be Expected in the Second Cut After Selective Logging.

The Region One Office of Forest Products in co-operation with the Office of Forest Management started field work to determine by means of a detailed stump and area analysis the growth in small western yellow pine trees after a partial cutting. Forest Rangers Robb and Austin of the Missoula Forest and Products Field Assistant Ibenthal started field work on the study late in September. I. V. Anderson is in charge of the work. It is expected that field work in the study will be completed about October 10.

Early operations of the Big Blackfoot Milling Company in the Blackfoot River drainage, thirty-five miles out of Missoula, have furnished excellent examples of timber "high grading." Many fair-sized blocks of virgin timber were cut over by this company as long as 35 years ago. At that time few trees under 14 inches in diameter were cut and most of the larger trees of poor quality were left. Records are available on a number of these blocks showing the date of cutting, and the volume removed. Approximately 4,000 board feet log scale per acre were removed in the first cut according to these records.

The timber department of the Anaconda Copper Mining Company, successors to the Big Blackfoot Milling Company are at present relogging those same areas. A cut of between 4 and 5 M per acre is being obtained. The old stumps from the first cutting still remain on the area. An analysis of these stumps together with that of the new ones resulting from the second cut should give some excellent data on the growth by tree sizes. According to a few stump analyses recently made excellent growth exceleration after partial cutting in this type for this region is indicated.

With the results obtained in this study available it will be possible to tell the private operator, with some degree of accuracy, what he can expect in the way of a second cut if he logs his present stands selectively.

Service Records of Arsenic-Treated Lodgepole Pine and Douglas Fir Poles.

One of the oldest installations from which records on the durability of poles treated with Anaconda Wood Preservative are being obtained in this region, is the Montana Power Company's Two Dot Telephone Line from King's Hill to Musselshell Ranger Station in the Jefferson Forest.

The test sections of this line include the following conditions of treatment and dates of setting:

1. Butt-treated with six pounds of Cold Treater Dust
   285 poles set July and August, 1926.
   438 " " August and September, 1927.

2. Treated With Anaconda Wood Preservative Paste.
   51 poles set August, 1925, shaved and pasted August, 1929.

3. Untreated, 95 poles.

A total of 869 poles, of which 774 are located in the Two Dot line and 95 in a Forest Service branch.

An inspection of all the poles was made by Assistant Supervisor Brown of the Jefferson Forest and Mr. W. L. Powell of the Montana Power Company during the last part of August. The results of this inspection as summarized by Mr. Powell in a report received from Forest Supervisor Willey on September 22 are presented below:

"Of the 774 poles on Two Dot line 528 were in the writer's opinion sound, that is, any fungous discoloration was not visible readily but in many instances discernible under magnifying glass.

"Thirty-five poles had indications of the thread like fungus growth in pole checks, resembling a distinct orange colored thread in checks extending below ground line. This was considered the very first visible indication and was restricted to the large checks only.

"Eighty-one poles slightly decayed were indicated by the presence of the orange discoloration in all checks below the ground line, many checks being so small that they were quite difficult to trace above ground line. Inspection established beyond any doubt that fungus had its birth in the minute checks which can be traced from ground line down.

"Forty-nine poles were in the developed condition, that is, the fungus discoloration had radiated from one check to another around the pole, leaving the outside fibers perceptibly broken down.

"Eighty-one poles were found to be in advanced stages of decay, that is, depth of decay ranged from ¼ inch in depth to 2 inches; in this case it means stubbing the pole is necessary.

"The Forest Service line from Two Dot Tap to Musselshell Ranger Station was not treated and results of inspection are as follows:

95 poles total set and inspected
26 poles considered sound
0 poles indicated in decay
2 poles slight in decay
12 poles developed in decay
55 poles advanced in decay

"Although the percentage of advanced stages in poles on the Forest Service line is greater in comparison, yet it was found in actuality there is but little difference. The Forest Service jobs set in limestone showed the greatest decay which was also the cast on Two Dot Line where poles were set in the same strata.

"Sound 50%, indicated decay 10%, slight decay 10%, developed decay 10%, advanced decay 20%.

"Upon inspection the paste was found adhering uniformly to the pole but under its protective coating the indications were very readily seen.

"The deduction from this examination seems to point to the fact that once the fungus has manifested itself in the fibers of wood, arsenic has no toxic value in destroying it and the growth continues without further hindrance.

"The preservative effect of arsenic seems to be mainly in isolating the pole from the surrounding soil bacteria and so delaying the advent of fungus growth in the pole but the changing characteristics of the pole, both in movement in its setting and the closing and opening of new checks seem to break down the protective coating of the arsenic and once the fungus has gained admission the growth progresses rapidly."

According to a letter from Forest Supervisor Willey concerning future maintenance of this co-operative pole line it appears that the use of Anaconda dust or paste will be discontinued in favor of the creosote method of treatment.

Four other inspection reports covering arsenic treated timbers in the Absaroka, Deerlodge, Madison and Helena Forests were received from the Forest Supervisors during the month but with only one exception the timbers reported on have been in service for too short a time to draw any definite conclusions.

Lumber Prices & Movement	Annual 1929	1st Q. 1930	2nd Q. 1930	July 1930	Aug. 1930
Av. Mill-Run Prices					
Idaho White Pine	$34.44	$35.33	$34.28	$33.51	$33.04
Western Yellow Pine	26.17	24.57	23.29	19.71	19.44
Larch-Fir	20.39	18.35	18.28	16.90	16.59
White Fir	20.94	19.45	18.45	16.45	16.64
Spruce	24.23	23.51	22.76	21.19	21.22

Shipment and Cut	1929	1930
Shipment	178,794	118,776
Cut	182,159	138,676

Branch of Research

Survey of Sawmill Waste in the Douglas Fir Region

During the month Hodgson completed the compilation of the data resulting from the study of four hemlock mills last winter. Progress reports dealing with each of the nine shifts studied have been prepared, with copies forwarded to the companies in whose mills the work was conducted.

As shown by the following table, the over-run of lumber was markedly higher when the logs were scaled on a 40-foot length basis (commercial practice of the region) than when scaled on a 32-foot length basis (usual Forest Service practice):

Log-length Basis	Over-run (Scribner Decimal "C" Log Rule)				
	Mill "A"	Mill "B"	Mill "C"	Mill "D"	Average
Feet	Per cent	Per cent	Per cent	Per cent	Per cent
40	16.217	16.340	14.760	43.240	22.639
32	7.693	8.110	8.175	31.485	13.866
Difference	8.524	8.230	6.585	11.755	8.773

The relatively higher over-run in Mill "D" was to be expected. It is not only a modern mill, equipped for close utilization of the log, but the aim of the company is to reduce wood and other waste to the minimum.

A large part of the waste at all four mills is converted into pulp chips and utilized at near-by pulp mills.

One of the mills operates a so-called "break down" shift at night at which time small and inferior logs unsuited for the economical production of lumber are sawed into pulpwood. Some logs of this type result in the ordinary logging operation, but in the case of this company they are logged expressly for pulpwood. The "break down" shift in this case presumably is profitable. It unquestionably results in closer utilization in the woods.

Felling and Bucking Study

Spelman and Johnson spent a part of the month in the field on this study. With the work well under way at the operation of the Clark-Wilson Lumber Co., Wilark, Oregon, they were forced to change their plans as the result of a forest fire closing the camp down. Study was barely resumed

at the operation of the Hammond Lumber Company, Detroit, Oregon, when Spelman sprained his ankle in making a rapid retreat over down timber from a bunch of hornets.

The Clark-Wilson Lumber Company were working the rigging crews relatively close to the fallers and buckers, giving the fallers but little chance to work the timber for a minimum of breakage. It may be, however, that the procedure obtains only during the fire season.

On the way to Detroit Spelman and Johnson visited the operation of a small truck logger who is cutting second-growth Douglas fir (about 65 years old) purchased from farmers. The logs are auto-trucked five miles to the mill and sold for $7.00 per thousand feet, log scale. The falling and bucking was done by contract at $1.25 per thousand. A set of two fallers are employed, their output of 23 to 25 thousand feet fixing the output of the camp. The timber is utilized down to 12 inches on the stump and 8 or 10 inches in the tops. The logs are bucked into 16-foot lengths. Two teams are used in skidding, with a fifth horse employed at the loading ground. Two trucks haul about 25 thousand feet of logs five miles over a dirt road to the mill per day, together averaging 15 to 17 loads.

1929 Census of Lumber, Lath, Shingles, Logs, Cooperage and Veneer

This survey was brought to completion during the month. It included reports from 2120 companies, of which 60 were mailed to Washington during September. The tabulation of the results by counties and classes and sizes of operations, etc. is now in progress, although final figures will not be available for some time. It seems, however, that the lumber cut of Oregon and Washington in 1929 was about the same as in 1928, possibly slightly larger. The final reckoning will probably show that the mills east of the Cascades cut less lumber, and west side mills exceeding their 1928 cut.

The following table shows the lumber cut of Oregon and Washington by regions for several years. It will be noted that the bulk of the lumber is cut west of the Cascades, also that 1926 was a peak year in all the regions except that of eastern Washington where the 1926 cut was practically the same as 1925. Although the lumber cut of the Douglas fir region of Oregon and Washington has doubled since 1915, it has varied but little in the last five years. Over a period of years, western Oregon, as would be expected, shows a somewhat greater proportional increase in the cut than western Washington. The cut in eastern Washington has increased but little in the past ten years. As in the case of the Douglas fir region, there has been a marked increase in the lumber cut of eastern Oregon in recent years; the decline in 1927 and 1928 was the result of a relatively weak lumber demand or production curtailment of manufactures, rather than any general depletion of timber supplies.

Year	West Side (Douglas Fir Region)		East Side (W. Y. Pine Region)		Total Oregon and Washington
	Washington	Oregon	Washington	Oregon	
	M ft.	M ft.	M ft.	M ft.	M ft.
1928	6,700,942	3,388,009	604,335	983,915	11,677,201
1927	6,749,556	3,131,239	576,356	861,613	11,318,714
1926	6,871,104	3,384,367	675,135	1,070,368	12,000,974
1925	6,346,996	3,130,655	680,329	1,085,728	11,243,708
1920	4,969,130	2,609,012	555,379	707,086	8,840,607
1918	4,194,886	2,180,400	407,583	528,555	7,311,424
1917	3,920,899	1,953,604	383,550	532,179	6,790,232
1916	4,153,124	1,738,047	339,873	483,807	6,714,851
1915	3,639,135	1,432,613	310,865	257,387	5,640,000

FOREST ECONOMICS

Frank, who has been helping the Bureau of Agricultural Economics in connection with the study of land utilization in Knott County, Kentucky, returned to the office the middle of the month, and left for Madison where he is planning to do graduate work in land utilization at the University of Wisconsin. This work is being done under a fellowship given by the Pack Forest Education Board. Completion of the forestry portion of the Kentucky work will be in charge of R. B. Craig, who is employed jointly by the University of Kentucky and the Bureau of Agricultural Economics.

Marsh left for a two months' western trip on September 26.

For the Inter-American Conference on Agriculture, Forestry and Animal Industry, which has now been rechristened "The Inter-American Conference on Agriculture," and which met in Washington September 8-20, a paper on forest surveys was prepared. This paper was presented by the Forester at one of the sessions.

Stumpage and Log Prices

The questionnaires obtained through cooperation by the Bureau of the Census, relative to private stumpage and log sales during 1928 have been edited and compiled, and the data tabulated by States. The stumpage tables are based on 3,236 transactions, involving over eight billion feet of timber in 39 States. The log tables are based on 2,493 transactions, involving over one billion feet of timber in 32 States. Data on log sales were not collected for Oregon, Idaho, Montana and Washington. It is expected that the results of the 1928 questionnaires will be issued in the form of a circular or pamphlet.

Due to the heavy volume of work being done by the Bureau of the Census at this time and the fact that the questionnaires for 1929 are still coming in, compiling and tabulating of the 1929 data will not get under way until the Census work is completed and their lists closed. In the interim the 1927 questionnaires are being checked, edited, and tabulated. This work should be completed in about six weeks.

FOREST TAXATION INQUIRY

The staff was chiefly occupied with office work both on incompleted studies and on the factual portion of the final report.

Hall and Herbert attended the Annual Field Day of the Yale School of Forestry at Keene Forest on September 6. The subject of the afternoon session was forest taxation in New Hampshire. It is encouraging to note

that in connection with the present movement for forest tax reform in that state, great emphasis is being placed on a specific program providing for the necessary revenues to replace those which it is expected will be lost as a result of tax reduction on forest land. Herbert made a short talk on behalf of the Inquiry.

Wager represented the Inquiry at a meeting of the North Carolina Forestry Association at North Wilkesboro on September 9. He presided at the session dealing with land utilization in North Carolina, and gave a talk on this subject.

Nieuwejaar had a short conference with Professor Haig at New York City, with particular reference to the materials collected by the latter in Germany.